PGQP01

Entrance Test for the Course(s): B.Ed. (Education) [CUHAR], [CUJHD], [CUKNK]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the Teaching Aptitude.
Entrance Test for the Course(s): L.L.M. (Law) [CUHAR], [CUKER], [CUKNK], [CUPUN], [CUSBR], (Tribal and Customary Law/Human Rights) [CUJHD], (Law (Corporate Governance and Industrial Jurisprudence)) [CUTND]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following Syllabus:

**CONTRACT-I: GENERAL PRINCIPLES OF CONTRACTS**


CONSTITUTION


UNIT-III: Judicial process under the Constitution, Nature of Judicial Review, Judicial Review Arts. 32, 226 and 227, Court system in India, Judges- Appointments, conditions of service, etc., Advisory Jurisdiction of the Supreme Court, Public Interest Litigation, Activism v. Restraint.

UNIT-IV: Federalism, Center-State Relations, Freedom of Inter State Trade, Methods of Constitutional Amendment, Limitation on Constitutional Amendment.


LAW OF TORTS

UNIT-II: General Defences, Vicarious Liability.

UNIT-III: Negligence; Nuisance; Absolute and Strict liability. Legal Remedies-Awards-Remoteness of damage.

UNIT-IV: Torts against person: Torts affecting body- Assault, Battery, Mayhem and False Imprisonment; Torts affecting reputation-Libel and Slander, Torts affecting freedomMalicious Prosecution, Malicious Civil Action and Abuse of Legal Process; Torts affecting domestic and other rights-Marital Rights, Parental Rights, Rights to Service, Contractual Rights, Intimidation and Conspiracy; Torts against property.

UNIT- V: Consumer Protection Act, 1986

FAMILY LAW- I: HINDU LAW

Remedies - Maintenance and Alimony; Customary Practices and legislative provisions relating to dowry prohibition.


CRIMINAL LAW-I: INDIAN PENAL CODE
UNIT – I: General Principles of Crime; Conceptions of Crime; Distinction between Crime and other wrongs under common Law – Crime and morality distinction – Circumstances when morality amounts to crime - State’s responsibility to detect, control and punish crime. Principles of criminal liability – Actus reus and mens rea (also statutory offences) and other maxims; Variations in liability – Mistake, intoxication, compulsion, legally abnormal persons; Possible parties to the crime: Principal in the I degree; Principal in the II degree; Accessories before the fact; Accessories after the fact. Indian Penal Code: General Explanation, Sections 6 – 33 and 39 – 52A; Punishment, Sections 53 – 75- social relevance of Capital Punishment - Alternatives to Capital Punishment - Discretion in awarding punishment and minimum punishment in respect of certain offences with relevance to precedents (judgments).

UNIT – II: General Exceptions: Sections 76 – 106; Criminal act by several persons or group: Sections 34 – 38; Abetment: Sections 107 – 120; Criminal Conspiracy: Sections 120A & 120B; Offences against State: Sections 121 – 130; Offences against the public tranquility: Sections 141 – 160; Offences relating to election: Sections 171A – 171; Contempt of lawful authority and public servants: Sections 172 – 190; False evidence and offences against public trust: Sections 172 – 229; Offences relating to coins and Government Stamps: Sections 230 – 263A; Offences relating to weights and measures: Sections 260 – 294A; Offences relating to religion: Section 295 – 298.


UNIT – V: Mischief (Sections 425 – 440) - Criminal Trespass (Sections 441 – 462) - Offences relating to document and property marks (Sections 463 – 480) - Offences relating to marriage (Sections 493 – 498 A) - Defamation (Sections 499 – 502); Criminal intimidation and annoyance and attempt to commit such offences (Sections 506 – 511).

**CONTRACT-II**


**COMPANY LAW**


UNIT – II: AOA – Prospectus – Directors – Meetings – Role of Company Secretary – Dividends; Brief analysis of corporate ethics.


UNIT - V: FEMA Act, 1999; Competition Act, 2002; Brief introduction to BPO & LPO.

PROPERTY LAW
UNIT – I: General principles of Transfer of Property by Act of parties inter- vivos- Concept and meaning of immovable property- Transferable Immovable Property- Persons Competent to transfer - Operation of Transfer- Conditions restraining alienation and restrictions repugnant to the interest created- rule against perpetuity and exceptions- Direction for accumulation- Vested and Contingent interest.

UNIT – II: Doctrine of election- transfer by ostensible and co-owner- Apportionment- Priority of rights- Rent paid to holder under defective title- Improvements made by bonafide holder Doctrine of Lis pendens- Fraudulent transfer and part-performance.


UNIT – IV: Sale of immovable property: Rights and liabilities of seller and buyer before and after completion of sale- Difference between sale and contract for sale; Leases of immovable property: Definition- Scope- creation of lease- rights and liabilities of lessor and lessee Determination and holding over; Exchange: Definition and mode- Actionable Claims; Gifts: Scope- meaning- mode of transfer- universal gifts- onerous gifts.


ADMINISTRATIVE LAW

UNIT –II: Legislative power of the administration- Extent of delegation and control over delegated Legislation- Sub-delegation- Judicial- Parliamentary control over delegated Legislation.

UNIT-III: Judicial power of Administration- Nature of procedure- Principles of Natural justice Effect of non-compliance with principles of Natural Justice- Exception to principles of Natural Justice.

FAMILY LAW –II: MOHAMMEDAN LAW AND INDIAN SUCCESSION ACT
UNIT-I: Development of Islamic Law: Advent of Islam & development of Muslim Law, Schools of Islamic Law, the Shariat Act, 1937; Concept of Marriage: Definition, object, nature, essential requirements of a Muslim marriage, classification of marriage - Legal effects of valid, void and irregular marriage - Muta marriage; Sources of Islamic law; Customary practices and State regulation: Polygamy; Child marriage; Pre-emption; Wakf; Dower.

UNIT-II: Conversion and its consequences on family: Marriage, Guardianship, Succession; Child and Family: Legitimacy, Custody, maintenance and education, Guardianship and parental rights.

UNIT-III: Matrimonial Remedies under Islamic Law and Indian Divorce Act, 1869 (Amended Act) - Nullity of marriage - Bar to matrimonial relief; Alimony and Maintenance: Alimony and Maintenance as an independent remedy - A review under Muslim law, Indian Divorce Act,1869, provisions under the Criminal Procedure Code, 1973; Maintenance of divorced Muslim Women under the Muslim Women (Protection of Rights on Divorce) Act, 1986.

UNIT-IV: Will and Inheritance: Will- Meaning, difference between will and gift, Will made in death bed or during illness; Muslim law of Inheritance- Shia and Sunni schools; Distribution of property under Indian Succession Act of 1925 (Of Christians, Parsis and Jews)- Domicile - Parsis Intestate succession and Non Parsis Intestate succession, Succession certificate, Probate and letters of administration, powers and duties of executor.


ENVIRONMENTAL LAW

UNIT- II: Environmental Policy and Law: Environmental Policy : Pre & Post Independence Period; From Stockholm to Johannesburg Declaration (Rio) and Role of Government - Five year Plans - Forest Policy - Conservation strategy - Water Policy; Conservation of Natural Resources

UNIT - III: International Law and Environmental Protection: International conventions in the development of Environmental Laws and its Policy - From Stockholm to recent conventions (Special Emphasis on Major conventions & Protocols) - Control on Marine Pollution; Common Law aspects of Environmental Protection; Remedies under other Laws (I.P.C., Cr.P.C, C.P.C.) - Riparian rights and prior-appropriation.


LABOUR LAW

UNIT –II: Industrial Disputes Act, 1947: Lay-off –Retrenchment- Closure - Unfair Labour Practices and Role of Government; Authorities under the Act (Chapter II) to be read with chapters II B, III and IV Adjudication and Arbitration; Restrictions on the right of the employer-Chapter IIA-Notice of change, section 11-A and sections 33,33A; Recovery of money due from an employer. Industrial Employment (Standing Orders) Act, 1946 and Disciplinary Enquiry.

UNIT-III: Trade Unions Act, 1926: Salient features of the enactment and important definitions - Registration of Unions, Amalgamation of Unions, Cancellation and Registration of Trade Unions, Funds of the Union, Immunity enjoyed by the Union. Workmen’s Compensation Act, 1923; Emergence of the legislation-Total and partial disablement –Dependent-Workman-Wages-Liability of the employer to pay compensation and right of the workman to receive compensation-Accident “Arising out of and in the course of employment”-Occupational disease-Doctrine of ‘Added peril’.


UNIT – I: Introductory and Pre-trial Process Meaning of procedure; The organization of the functionaries under the Code; their duties, functions and powers; First Information Report, complaint; Arrest; Types of trial and Features of a fair trial.


JURISPRUDENCE

UNIT – II: Functions and purpose of law, questions of law, fact and discretion - Justice and its kinds - Civil and Criminal Administration of Justice - Theories of Punishment and Secondary functions of the Court.


UNIT – IV: Legal Concepts: Right and Duty, Kinds, Meaning of Right in its wider sense; Possession: Idea of Ownership, kinds of Ownership, Difference between Possession and
Ownership; Nature of Personality, Status of the Unborn, Minor, Lunatic, Drunken and Dead Persons.


CLINICAL COURSE-I: PROFESSIONAL ETHICS AND PROFESSIONAL ACCOUNTING SYSTEM
UNIT-I: The legal profession and its responsibilities; The equipment of the lawyer; Conduct in court; Professional conduct in general; Privileges of a lawyer; Salient features of the Advocates Act, 1961.

UNIT-II: Duty to the court; Duty to the profession; Duty to the opponent; Duty to the client; Duty to the self; Duty to the public and the state.

UNIT-III: Contempt of Court Act, 1972
Selected major judgments of the Supreme Court:
1. In the matter of D, An Advocate, AIR 1956 SC 102.

UNIT-IV: Selected opinions of the Bar council of India
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PUBLIC INTERNATIONAL LAW

UNIT-I: Nature, definition, origin and basis of International Law; Sources of International Law; Relationship between Municipal and International Law; Subjects of International Law.

UNIT- II: States as subjects of International Law: States in general; Recognition; State territorial sovereignty.

UNIT –III: State Jurisdiction: Law of the sea; State Responsibility; Succession to rights and obligations.
UNIT – IV: State and Individual - Extradition, Asylum and Nationality; the agents of international business; diplomatic envoys, consuls and other representatives; the law and practice as to treaties.

UNIT – V: The United Nations Organisation - Principal organs and their functions; World Trade Organisation- Main features; International Labour Organisation.

HUMAN RIGHTS LAW AND PRACTICE


RIGHT TO INFORMATION
UNIT-I: Right to Information before Right to Information Act, 2005; Significance in democracy; Constitutional basis; Supreme Court on right to information.

UNIT-II: RTI Act- definitions; Right to information and obligations of public authorities.

UNIT-III: Central information commission; State information commission; Powers and functions of information commissions; Appeals and penalties.


UNIT-V: Best practices- A study of decisions rendered by state commissions and central Commission in the following areas of – Police, Revenue, PWD, Irrigation, Secretariat, BSNL, Posts and Telegraphs, Scheduled Banks, CPWD, Income Tax Department, Central Excise Department, Local Authorities.

BANKING LAW


INSURANCE LAW


ALTERNATIVE DISPUTE RESOLUTION SYSTEMS
UNIT-I: General; Different methods of dispute resolution; Inquisitorial method; Adversarial method; Other methods- both formal and informal- like Arbitration, Conciliation, Negotiation, Mediation, etc.; Advantages and disadvantages of above methods; Need for ADRs; International commitments; Domestic needs; Suitability of ADRs to particular types of disputes; Civil Procedure Code and ADRs.

UNIT-II: Arbitration: Meaning of arbitration; Attributes of arbitration; General principles of arbitration; Different kinds of arbitration; Qualities and qualifications of an arbitrator; Arbitration agreement and its drafting; Appointment of arbitrator; Principal steps in arbitration; Arbitral award; Arbitration under Arbitration and Conciliation Act, 1996.

UNIT-III: Conciliation: Meaning; Different kinds of conciliation- facilitative, evaluative, courtannexed, voluntary and compulsory; Qualities of a conciliator; Duties of a conciliator; Role of a conciliator; Stages of conciliation; Procedure; Conciliation under statutes Industrial Disputes Act, 1947; Family Courts Act, 1984; Hindu Marriage Act, 1955; Arbitration and Conciliation Act, 1996.

UNIT-IV: Negotiation: Meaning; Different styles of negotiation; Different approaches to negotiation; Phases of negotiation; Qualities of a negotiator; Power to negotiate.

UNIT-V: Mediation: Meaning; Qualities of mediator; Role of mediator; Essential characteristics of the mediation process – voluntary, collaborative, controlled, confidential, informal, impartial & neutral, self-responsible; Different models of mediation; Code of conduct for mediators.

CIVIL PROCEDURE CODE AND LIMITATION ACT
UNIT – I: Civil Procedure Code Introduction; Distinction between procedural law and substantive law- History of the code, extent and its application, definition; Suits: Jurisdiction of the civil courts- Kinds of jurisdiction-Bar on suits- Suits of civil nature (Sec.9); Doctrine of Res sub judice and Res judicata (Sec. 10, 11 and 12); Foreign Judgment (Sec. 13, 14); Place of Suits (Ss. 15 to 20); Transfer of Cases (Ss. 22 to 25).
UNIT – II: Institution of suits and summons: (Sec. 26, 0.4 and Sec. 27, 28, 31 and O.5); Interest and Costs (Sec. 34, 35, 35A, B); Pleading: Fundamental rules of pleadings- Plaintiff and Written Statement- Return and rejection of plaint- Defences- Set off- Counter claim; Parties to the suit (O. 1): Joinder, misjoinder and non-joinder of parties- Misjoinder of causes of action-Multifariousness.

UNIT – III: Appearance and examination of parties (O.9, O.18) - Discovery, inspection and production of documents (O.11 & O.13) - First hearing and framing of issues (O.10 and O.14) - Admission and affidavit (O.12 and O.19) - Adjournment (O.17) - Death, marriage-Insolvency of the parties (O.22) - Withdrawal and compromise of suits (O.23) - Judgment and Decree (O.20); Execution (Sec. 30 to 74, O.21): General principal of execution- Power of executing court-Transfer of decrees for execution- Mode of execution- a) Arrest and detention, b) Attachment, c) Sale.

UNIT – IV: Suits in particular cases; Suits by or against Governments (Sec. 79 to 82, O.27); Suits by aliens and by or against foreign rulers, ambassadors (Sec. 85 to 87); Suits relating to public matters (Sec. 91 to 93); Suits by or against firms (O.30); Suits by or against minors and unsound persons (O.32); Suits by indigent persons (O.33); Inter-pleader suits (Sec. 88, O.35); Interim Orders; Commissions (Sec. 75, O.26); Arrest before judgment and attachments before judgment (O.38); Temporary injunctions (O.39); Appointment of receivers (O.40); Appeals (Ss. 90 to 109, O.41, 42, 43, 45); Reference- Review and Revision (Ss. 113, 114, 115, O.46, O.46); Caveat (Sec. 144.A)- Inherent powers of the court (Ss. 148, 149, 151).

UNIT –V: Limitation Act.

INTELLECTUAL PROPERTY RIGHTS-I
UNIT – I: Introductory Aspects: Overview of the concept of property; Industrial property and non-industrial property; Historical background of IPR; Importance of human creativity in present scenario; Different forms of IP and its conceptual analysis. Patents: Introduction and overview of patent protection; History of Patent protections; What is patent and definition of patent; Object of patent; Scope and salient features of patent; How to obtain patent; Product patent and Process patent; Specification – Provisional and complete specification; Procedure for patent applications; Register of patents and Patent Office; Rights and obligations of patentee; Transfer of Patent Rights; Government use of inventions; Biotech patents and patentability of life forms; Infringement of Patents; Offences and Penalties.

UNIT – II: Trade Marks: Introduction and overview of trade mark; Evolution of trade mark law; Object of trade mark; Features of good trade mark; Different forms of trade mark; Trade mark registry and register of trademarks; Property in a trade mark; Registrable and nonregistrable marks; Basic principles of registration of trade mark; Deceptive similarity; Assignment and transmission; Rectification of register; Infringement of trade mark; Passing off; Domain name protection and registration; Offences and penalties.

UNIT-III: Introduction and overview of Cyber Intellectual Property; Intellectual property and cyberspace; Emergence of cyber-crime; Grant in software patent and Copyright in software;
Software piracy; Trademarks issues related to Internet (Domain name); Data protection in cyberspace; E-commerce and Econtract; Salient features of Information Technology Act; IPR provisions in IT Act; Internet policy of Government of India.

UNIT-IV: Geographical Indications: Introduction and overview of geographical indications; Meaning and scope of geographical indications; Important geographical indications of India and their features; Salient features of the Protection of Geographical Indications Act; Protection of geographical indications; Misleading use of geographical indications; Registration of geographical indications; Right to use geographical indications; Infringement; Remedies against infringement; Role and functions of Registrar of Geographical indication; Conflict between Trade mark and geographical indications.

UNIT-V: International Convention and Treaties: Paris Convention: Background; Salient features of Paris Convention; Governing rules of Paris Convention; Patent Cooperation Treaty: Background; Objectives of PCT; Salient features of PCT; Madrid Convention: Salient features; International registration of marks; World Intellectual Property Organization: Background; Salient features WIPO; Organization of WIPO.

INTELLECTUAL PROPERTY RIGHTS-II
UNIT-I: Indian Copyright Law: Introduction and overview of copyright: History of the concept of copyright and related rights; Nature of copyright: Salient features of Copyright Act; Subject matter of copyright; Literary work; Dramatic work; Musical works; Artistic works; Cinematographic films; Sound recordings; Term of copyright; Computer software and copyright protection; Author and ownership of copyright; Rights conferred by copyright; Assignment, transmission and relinquishment of copyright; Infringement of copyright; Remedies against infringement.

UNIT-II: Biological Diversity Law: Introduction and overview of Biological Diversity; Meaning and scope of Biological Diversity; Biological resources and traditional knowledge; Salient features of Biological Diversity Act; Biological Diversity concerns and issues; Bio piracy; Regulation of access to Biological Diversity; National Biodiversity Authority; Functions and powers of Biodiversity Authority; State Biodiversity Board; Biodiversity Management Committee and its functions.

UNIT-III: Protection of Plant Varieties and Farmers Rights Law: Legal concepts relating to the protection of plant varieties rights; Legal concepts relating to the protection of plant breeders rights; IPR in new plant varieties; Policy and objectives of protection of plant varieties and farmers rights act; Plant varieties and Farmers rights protection authority; National register of plant varieties; Procedure for registration; Rights and privileges; Benefit sharing; Compensation to communities; Compulsory licence; Relief against infringement; National Gene Fund.

UNIT-IV: Designs Law: Introduction and overview of Designs Law; Salient features of Designs Law; Procedure for registration; Rights conferred by registration; Copyright in registered designs; Infringement ; Powers and duties and Controller; Distinction between design, trade mark, copyright & patent.
UNIT-V: International Treaties / Conventions on IPR: TRIPS Agreement: Background; Salient Features of TRIPS; TRIPS and Indian IPR; Berne Convention: Background; Salient features of Paris Convention; Convention of Bio-Diversity: Objectives of CBD; Salient features of CBD; International IPR agreements affecting protection of plant varieties: The WTO Doha round of trade negotiations; International Treaty on Plant Genetic Resources (“ITPGR”).

**PENOLOGY & VICTIMOLOGY**

UNIT – I: Introduction: Notion of punishment in law; Difference between crime prevention and control; Theories of punishments.

UNIT - II: Kinds of punishment; Sentencing policies and processes; the riddle of capital punishment.

UNIT - III: Prison reforms; Alternatives to imprisonment; Victimology- Introduction, history and philosophy.

UNIT – IV: Victimology- European experience; American experience; Victim witness assistance programmes; Restitution.

UNIT – V: Victimology - Indian experience; Legal framework; Role of Courts; Role of NHRC.

**INTERPRETATION OF STATUTES & PRINCIPLES OF LEGISLATION**

UNIT-I: Basic Principles; Guiding rules; internal aids to construction.

UNIT-II: External aids to construction.

UNIT-III: Subsidiary rules; Operation of statutes; Expiry and repeal of statutes.

UNIT-IV: Statutes affecting the state; Statutes affecting the jurisdiction of courts. Construction of taxing statutes and evasion of statutes; Remedial and penal statutes.

UNIT-V: Principles of Legislation.

**COMPETITION LAW**

UNIT-I: Constitutional provisions regulating trade; Salient features of MRTP Act, 1986; Salient features of Consumer Protection Act, 1986.


UNIT-III: The Competition Act, 2002; Preliminary; Prohibition of certain agreements, abuse of dominant position and regulation of combinations. UNIT-III Competition Commission of India; Duties, powers and functions.
UNIT-III: Duties of Director general; Penalties; Competition advocacy; important judgments of the Supreme Court.

LAW OF EVIDENCE

UNIT-II: Relevancy and admissibility of confessions- Admissibility of information received from an accused person in custody- Confession of co-accused (Sections 24 to 30) - Admitted facts need not be proved (Section 58); Dying declaration- Justification for relevance;Judicial standards for appreciation of evidentiary value-Section 32 (1) with reference to English Law - Other statements by persons who cannot be called as witnesses- (Sections 32(2) to (8), 33)- Statement under special, circumstances (Sections 34 to 39); Relevance of judgments- General principles – Fraud and collusion (Sections 40 to Sec. 44); Expert testimony: General principles (Sections 45-50) - Who is an expert- Types of expert evidence – Problems of judicial defence to expert testimony.

UNIT-III: Character evidence- Meaning – Evidence in Civil Criminal cases; English Law (Sections 52-55)- Oral and documentary Evidence -Introduction on Proof of facts General principles concerning oral; Evidence (Sections 59-60)- General principles concerning documentary; Evidence (Sections 61-90)- General principles regarding exclusion by evidence (Sections 91-100).

UNIT-IV: Burden of Proof- The general conception of onus probandi (Section 101)- General and special exception to onus probandi (Sections102-106)- The justification of presumption and burden of proof (Sections 107 to 114) with special reference to presumption to legitimacy of child and presumption as to dowry death-Doctrine of judicial notice and presumptions. Estoppel: Scope of Estoppel - Introduction as to its rationale (Section 115)- Estoppel distinguished from Res judicata - Waiver and Presumption- Kinds of Estoppel- Equitable and Promissory Estoppel-Tenancy Estoppel (Section 116).

UNIT-V Witness, Examination and Cross Examination: Competence to testify (Sections 118 to 120)-Privileged communications (Sections 121 to 128)- General principles of examination and cross examination (Sections 135 to 166)- Leading questions (Sections 141- 145)- Approver’s
testimony (Section 133)- Hostile witnesses (Section 154)- Compulsion to answer questions (Sections 147, 153)- Questions of corroboration(Sections 156-157)- Improper admission of evidence.

TAXATION


UNIT- IV: Customs Laws: Legislative background of the levy- Appointment of Customs officers Ports- warehouses- Nature and restrictions on exports and imports- Levy, exemption and collection of customs duties, and overview of law and procedure - Clearance of goods from the port, including baggage- Goods imported or exported by post, and stores and goods in transit- Duty drawback provisions.

UNIT-V: Central Sales Tax Laws: Evolution and scope of levy of Central Sales tax- Inter- State sale outside a State and sale in the course of import and export- Basic principles Registration of dealers and determination of taxable turnover; Service Tax – Main features of Service Tax; VAT- Introduction to Value Added Tax.

WOMEN AND CRIMINAL LAW & LAW RELATING TO CHILD

UNIT-II: Different Personal Laws- Unequal Position of Indian Women-Uniform Civil Code; Sex Inequality in Inheritance Rights: Right of Inheritance by birth for Sons and not for Daughters; Inheritance under Christian Law; Inheritance under Muslim Law; Matrimonial Property Law; Right of Women to be Guardian of her minor sons and daughters.

UNIT-IV: Women and Criminal Law: Adultery; Rape; Outraging the Modesty of Women; Kidnapping; Sati Prohibition Law; Law relating to Domestic Violence; Law relating Eve Teasing; Indecent Representation of Women Act.


LAW RELATING TO INTERNATIONAL TRADE
UNIT-I: Historical perspectives of International Trade, Institutions – UNCTAD, UNCITRAL, GATT (1947-1994); World Trade Organization-Objectives, Structure, Power; Most Favored Nation Treatment and National Treatment; Tariffs and Safeguard measures.

UNIT-II: Technical Barriers to Trade; Sanitary and Phyto- sanitary measures; Trade Related Investment Measures (TRIMs); Anti- Dumping, Subsidies and Countervailing Measures; Dispute Settlement Process.


UNIT-IV: Exports – Insurance of Goods in Transit; Marine Insurance and kinds; Law on Carriage of goods by sea, land and air, Container transport, Pre-Shipment Inspection; Licensing of Export and Imports.

UNIT-V: Laws Governing Finance and Investments; Foreign Collaboration and Investment Policy; Foreign Direct Investment in Industries and Governing Policies; Foreign Institutional Investors (FIIs): Investment by Non-resident Indians (NRIs) and Overseas Corporate Bodies (OCBs); Foreign Collaboration Agreement- Foreign Technology Agreement; Foreign Companies and Foreign Nationals in India.
PGQP03

Entrance Test for the Course(s): M.A. (Education) [CUPUN], [CURAJ].

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following Syllabus:
   I. **Education & Philosophy**: Nature & Meaning of Education, Relationship between Philosophy & Education
   II. **Major Philosophies of Education**: Naturalism; Idealism; Pragmatism
   III. **Educational Thinkers & their Contribution in developing Principles of Education**: M. K. Gandhi: Basic Education; Tagore, John Dewey: Learning by doing,
   IV. **Culture & Social Change**: Concept & Dimensions of Culture; Relationship between Culture & Education with special reference to conservative and creativity roles; Concept of social change and Roles of Education for social change.
   V. **Psychology & Educational Psychology**: Nature & Meaning of Psychology; Nature, Meaning and functions of Educational Psychology.
   VI. **Learning & Motivation**: Concept of learning & Motivation; Factors of influencing learning – Personal & Environmental, Techniques of enhancing learner’s motivation; S-R Theory of Learning (Thorndike), Classical conditioning (Pavlov), Operant Conditioning theory of learning (Skinner) and Gestalt theory of Learning (Kohler et al), Cognitive theory (Piaget), Social development theory (Vygotsky), Behaviourism, Constructivism and Eclectic approach.
   VII. **Growth and Development**: Concept, Stages of development, Role of hereditary and environment in the development of individual
   VIII. **Intelligence**: Nature & Meaning, Measurement of Intelligence – Concept of I.Q, Verbal, Nonverbal & Performance tests; Two-factor Theory (Spearman); Multifactor Theory (Thurston); Structure of intellect (Guilford), Multiple Intelligence (Gardner)
   IX. **Personality**: Meaning & nature and Development of Personality – biological & socio-culture determinant a brief overview of Trait-theory of Personality (Allport), Factor-theory.
Entrance Test for the Course(s): M.Ed. (Master of Education) [CUGUJ], [CUHAR], [CUJAM], [CUKER], [CUPUN], [CUSBR].

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following Syllabus:


**Unit- II:** Indian Society and Education: Education as a sub-system of Indian Society. Education and relationship with Indian Social Structure., Social Demand for Education, School as a Social Unit: Democracy in School life; Culture and Education.

**Unit-III:** Psychology & Educational Psychology: Nature & Meaning of Psychology; Nature, Meaning and functions of Educational Psychology. Learning & Motivation: Concept of learning & Motivation; Factors of influencing learning – Personal & Environmental, Techniques of enhancing learner’s motivation; S-R Theory of Learning (Thorndike), Classical conditioning (Pavlov), Operant Conditioning theory of learning (Skinner) and Gestalt theory of Learning (Kohler et al), Cognitive theory (Piaget), Social development theory (Vygotsky), Behaviorism, Constructivism and Eclectic approach.

**Unit-IV:** Intelligence and Personality : Nature & Meaning, Measurement of Intelligence – Concept of I.Q, Verbal, Non-verbal & Performance tests; Two-factor Theory (Spearman); Multifactor Theory (Thurston); Structure of intellect (Guilford), Multiple Intelligence (Gardner) Personality: Meaning & nature and Development of Personality – biological & socio-culture determinant a brief overview of Trait-theory of Personality (Allport), Factor-theory of Personality (Cattell), Psycho analytical theory of Personality (Freud), Maslow’s hierarchy of needs and their Educational implication.

**Unit-V:** Definition, concept and importance of inclusive education. Historical perspectives on education of children with diverse needs. Difference between special education, integrated education and inclusive education. Advantages of inclusive education for all children.

**Unit-VI:** Concept &Functions of Educational Management; Basis of management Planning, Organizing, Control, Direction and Financing. School as a unit of decentralization planning. Modern Management Techniques: Case study, Man power surveys; Educational Management information system (EMIS).

Unit-VIII: Elementary Education in India, Concept of Elementary Education, Objectives of Elementary Education (UEE), District Primary Education Programme (DPEP), Universalization of Elementary Education (UEE), Sarva Shiksha Abhiyan (SSA) 2002, Right to Education Act (RTE) 2009.

Unit-IX: Current issues: Universalization of Elementary Education with special reference to Sarva Siksha Abhiyan; Education of children with special needs, Women’s Education, Education of Weaker Sections.

Entrance Test for the Course(s): M.A. (English) [CUGUJ], [CUJAM], [CUJHD], [CUKNK], [CUPUN], [CURAJ], [CUSBR], [CUTND], (English Language & Literature) [CUAPH], (English and Foreign Language) [CUHAR], (English & Comparative Literature) [CUKER], (Linguistics and Language Technology) [CUKER], (Linguistics) [CUKNK]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following Syllabus:

I. History of English and Indian Literatures: General trends

II. Literary Terms: Allegory, ballad, blank verse, comedy, connotation and denotation, dissociation of sensibility, dramatic monologue, elegy, enlightenment, epic, fancy and imagination, free verse, imitation, intentional fallacy, meter, motif, ode, onomatopoeia, paradox, plot, point of view, satire, soliloquy, sonnet, tragedy, wit etc.

III. Literary Genres: Fiction and non-fiction (traditional and modern classification); autobiography, biography, diary, drama, essay, novel, poetry, prose, short story etc.; types and sub-types.

IV. Comparative Literature: Definition, scope, aims and objectives; key terms, literary historiography, myth, motif etc.

V. Literary trends and literary movements: Aestheticism, modernism and post-modernism, mysticism, naturalism, progressivism, realism, revolutionary literature, romanticism.

VI. Elementary knowledge of famous authors and texts: From Indian, Western and Classical literature.

VII. Awareness of current literary trends, events, activities, awards etc.
PGQP06

Entrance Test for the Course(s): M.A. (Hindi) [CUGUI], [CUHAR], [CUJAM], [CUJHD], [CUKNK], [CUPUN], [CURAJ], [CUSBR], [CUTND], (Hindi & Comparative Literature) [CUKER], P.G. Diploma (Hindi (Hindi Translation and Office procedure)) [CUKER], (Hindi (Mass Communication and media writing)) [CUKER], PG Certificate/ Diploma (Hindi-English Translation and Vice-versa) [CUJAM]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following Syllabus:

1. हिंदी साहित्य का काल विभाजन और नामकरण
2. हिंदी साहित्य का इतिहास (आदिकाल से आधुनिक काल तक)
   प्रमुख रचनाकार, रचनाएँ और प्रवृत्तियाँ
3. हिंदी साहित्य की विविध विधाएँ एवं रचनाकार
   (उत्तन्यास, कहानी, नाटक, निबंध, आलोचना एवं अन्य गद्य विधाएँ)
4. प्रयोजन मूर्त हिंदी के विविध रूप
5. जनसिंचार माध्यमों में हिंदी
   (समाचार पत्र और हिंदी, विज्ञान और हिंदी, रेडियो एवं टेलीविजन में हिंदी)
6. भारतीय काव्य शाखा (अद्व शक्ति, काव्य हेतु, काव्य प्रयोजन एवं काव्य लक्षण)
7. हिंदी व्याकरण (संधि, समास, काल, वाक्य विभाग)
Entrance Test for the Course(s): M.A. (Malayalam) [CUKER]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following Syllabus:
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Entrance Test for the Course(s): M.A. (Punjabi) [CUPUN]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following Syllabus:

   1. ਪੰਜਾਬੀ ਬਾਜ਼ਾਰ ਅਨੁਸਾਰ ਰਵਿਵਾਰ: ਪੰਜਾਬੀ ਅਨੁਸਾਰ ਰਵਿਵਾਰ
   2. ਭਾਸ਼ਾ ਪੰਜਾਬੀ ਅਨੁਸਾਰ: ਮੁਖਬੰਡ, ਮੁੱਥੀ, ਧੀਮੀ ਅਨੁਸਾਰ ਰਵਿਵਾਰ
   3. ਅੰਤਰਿਕਤ ਵਿਗਿਆਨ ਅਨੁਸਾਰ: ਗੁਝਰੀ, ਰਾਸ਼ਟਰੀ, ਕਾਲੀ, ਹੇਠਾਂ, ਵਿਧਾਨ ਅਧਿਕਾਰ
   4. ਸੂਪ੍ਰਸਿਧ ਪੰਜਾਬੀ ਅਨੁਸਾਰ: ਸੌਂਦਰਿਆ, ਦਰਸ਼ਨੀ, ਕਵਿਤਾ, ਰਾਤਸ਼, ਮਿਖਾਲ ਅਨੁਸਾਰ, ਸੂਰਧਮ ਅਨੁਸਾਰ, ਪ੍ਰੀਤ ਅਨੁਸਾਰ, ਹਵਾਰਾਜ਼ ਅਨੁਸਾਰ, ਮਿਖਾਲ ਅਨੁਸਾਰ, ਕਵਿਤਾ ਅਨੁਸਾਰ, ਮਿਖਾਲ ਅਨੁਸਾਰ, ਸੂਰਧਮ ਅਨੁਸਾਰ, ਪ੍ਰੀਤ ਅਨੁਸਾਰ, ਹਵਾਰਾਜ਼ ਅਨੁਸਾਰ
   5. ਇਸਤੇਮਾਲ ਅਨੁਸਾਰ ਰਵਿਵਾਰ: ਮੋਹਨਾ ਅਨੁਸਾਰ ਰਵਿਵਾਰ
   6. ਸਕੂਲਾਂ ਅਨੁਸਾਰ ਰਵਿਵਾਰ: ਸਕੂਲਾਂ ਅਨੁਸਾਰ ਰਵਿਵਾਰ
   7. ਸਕੂਲਾਂ ਅਨੁਸਾਰ ਰਵਿਵਾਰ: ਸਕੂਲਾਂ ਅਨੁਸਾਰ ਰਵਿਵਾਰ
   8. ਮਾਤਰਮਾਤਰ ਦੇ ਮਾਤਰਮਾਤਰ ਮਾਤਰਮਾਤਰ ਅਨੁਸਾਰ, ਪੰਜਾਬੀ ਅਨੁਸਾਰ, ਪੰਜਾਬੀ ਅਨੁਸਾਰ, ਮਾਤਰਮਾਤਰ ਅਨੁਸਾਰ
Entrance Test for the Course(s): M.A. (Classical Tamil Studies) [CUTND]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following Syllabus:

   **Unit-I:** History of Tamil Literature: Introduction to Literature: From Classical period to Modern period: Sangam – Post Sangam – Pallava period-Chola period-Nayakka period and Bhakti Movement and Modern Period.

   **Unit-II:** Texts on Tamil Grammar: Ezhuttu (Phonology), Col (Morphology)- (Nannu:) Porul Grammar (Nambiagappourl)- Ani (Figure of Speech- Thandiyalankaram)– Yappu (Prosody - Yapparunkalakka:rikai).

   **Unit-III:** Elements of General Linguistics and History of Tamil Language: Phonology, Morphology, Syntax and Semantics - History of the Indian Language families - Place of Tamil Language amongst the Indian Languages. Kinds of Dravidian Languages. Borrowing words in Tamil, Difference of Spoken and Written language and Dialects.

   **Unit-IV:** History and Culture of Tamil Nadu: Evidences which help to know the history of Tamil Nadu, Period of Sangam, period of Kalapras, Period of Later Chola and Pandya, period of Nayakka, Period of European, political, social and religion conditions.

   **Unit-V:** Literary Criticism: Modern Critical Theories. To describe some literary forms like Short stories, Novel, Prose and Drama through the principle of literary criticism.

   **Unit-VI:** Tamil Literature and other disciplines: Elements of Folklore, Computer application, Journalism.

   **Unit-VII:** Knowledge of Classical Tamil Texts: A few Agam and Puram Poems.

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PGQP10

Entrance Test for the Course(s): M.A. (Kannada) [CUKER], [CUKNK]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following Syllabus: Halegannada, Nadugannada, Hosagannada Sahitya, Shasana Shastra, Kavya meemamse, Bhashashastra, Janapada Sahitya, Sahitya Vimarshe, Chandassu, Vyakarana, Dalitavada, Streevada, Samskritika Adhayayana, Bhashantara, Toulanika Adhyayana

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Entrance Test for the Course(s): M.A. (History and Archaeology) [CUHAR], (History) [CUKNK], [CUPUN], [CUSBR], [CUTND]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following Syllabus:

**Ancient History of India (10000 BC to 1206 AD)**
Stone Age (Paleolithic, Mesolithic and Neolithic age), Chalcolithic Age, Indus Vally Civilization, Aryan & Vedic Age, State formation in Ancient India, Rise of Ancient Indian Empire (Haryank, Shishunag, Nanda Dynasty), Age of Religion (Buddhism & Jainism), Mauryan Age (Social, Political and Culture), Post - Mauryan Period (Indo-Greeks, Sakas, Kushanas, Western Kshatrapas), Early State and Society in South India (Kharavela, The Satavahanas, Tamil States of the Sangam Age; Administration, economy, art and architecture). Guptas, Vakatakas and Vardhanas (Administration, Society and Culture), Regional States during Gupta Era: The Kadambas, Pallavas, Chalukyas of Badami; Polity and Administration, Literature; growth of Vaishnava and Saiva religions. Palas, Senas, Rashtrakutas, Paramours, Polity and Administration.

**Early Medieval India (750 AD- 1206 AD)**
Major political developments in Northern India, the rise of Rajputs; The Cholas: administration, village economy and society; Indian Feudalism; Agrarian economy and urban settlements; Trade and commerce.

**Medieval History of India (1206-1707 AD)**
Establishment of Delhi-Sultabanate Rule (Mamulak, Khilji and Tughlaq dynasty), Administration of Delhi Sultanate (Military reform, Iqta system etc.), Art & Architecture Vijaynagar and Bahamani Kingdom (Rise, Social, Economic and Administration), Bhakti movement, Sufi Movement; Culture: Persian literature, Establishment of Mughal Empire (Administration, Society, Political and literature), Expansion of Mughal Empire (Babar to Aurangazeb), Rise of Sur dynasty, Decline of Mughal Empire.

**Modern History of India (1707 to 1947)**
Modern Historiography, Colonialism in India, British Raj & British Expansion in India, Imperialism, Social and Cultural Development, Structure of British administration (all Acts), Economic impact in British Period(Settlement) , Industrialization, Social and Religious Reform movement (Ram Mohan Rai, Swami Dayanand, Jyoiba Phule etc.), National movement in India, Mass movement and British Rule, Indian National Congress summit, Gandhian movement,
PGQP12

Entrance Test for the Course(s): MPA (Vocal Music) [CUJHD], (Performing Arts) [CUKNK]

1. **PART-A** will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. **PART-B** will consist of **75 objective questions** (MCQs) from the following syllabus:


   II. **Hindustani Music:** Bada Khayal and Chhota Khayal, Concepts of Ragas and Tala in Indian music, Classification of Ragas, Concert Singing, Thappa, Thumari, Kajari, Different Gharanas and their history, Evolution of Notation system, classical texts in music.

   III. **Forms of Light Music:** Bhavageet and folck music.

   IV. **Music & Literature:** Classical texts in music, modern texts in music, Place of Music in Fine Arts.

   V. **Musical instruments:** Laws of Acoustics, Musical Sound, Wave Motion, Frequency, Pitch and Volume.

   VI. **Carnatic and Hindustani instruments:** Working principle and differences, percussion and non-percussion instruments. Folk instruments of India.

   VII. **Dance:** Natya and its basics, forms, mudra, Indian styles of dance. Classic texts in dance. Tala in dance.

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PGQP13

Entrance Test for the Course(s): MPA (Theater/Dance/Music/ Drama) [CUPUN], (Theatre Arts) [CUJHD]

1. **PART-A** will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. **PART-B** will consist of **75 objective questions** (MCQs) from the following syllabus:

Dramatic literature of East and West, Modern plays and playwrights, Acting Techniques, Major directors of India and abroad, Current trends in Performing Arts, Performing Arts institutions, Famous Films and directors, Theatre Design like: Light, Costume, set design.

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Entrance Test for the Course(s): M.A. (Sanskrit) [CUHAR]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

**Phalakam-1 (Unit-1): संस्कृतवादित्यम्** — History of Sanskrit Literature

- वैदिकसाहित्य, बालिकाशास्त्र, आराध्यकृत्य, उपनिषद्गीत, ब्रजसाहित्य, दर्शनमाल, रमायनम, महाभारतम, पुराणां।
- कवयिका: वेदम्- पुराणे- दाशन, अनीदास: भारतविद्या, भारती, शूद्रशास्त्र, माधवी, सुदर्शन: माधवी, श्रीविनायक: श्रीविनायक।

Vaidikasahityas, Brāhmaṇa-granthas, Aranyaka-prāṇīs, Upaniṣads, Vedāṅgas, Darśanas, Ramayana, Mahābhārata, Purāṇas.

Poets and their Works: Bhāsa, Āsvaghoṣa, Kālidāsa, Bhāravi, Bhaṭṭi, Śūdraka, Bhavabhūti, Subandhu, Māgha, Bāṇabhaṭṭa, Daṇḍi, Śrīharṣa, Kalhaṇa.

**Phalakam-2 (Unit-2): संस्कृतवादित्यम् (Sanskrit Grammar)**

- वेदसाहित्यानि, यात्रावाणि, समासि, कारकाणि, भूप्रत्ययाः जैतृताः, तत्तताः।

Śabdārūpas, Dhāturūpas, Sandhi, Samāsa, Kāraṇa, Strīpratya, Kṛdanta, Taddhitas.

**Phalakam-3 (Unit-3): संस्कृतवादित्यम् च (Sanskrit Poetics and Prosody)**

- आद्वारिकाः भरत, भामह, दण्डी, वामान, आनन्दद्रव्य, गुलक, ममत्त, क्रेमेन्द्र, विधानां। प्रसिद्धा: अद्वारिका, प्रसिद्धानि छन्दिले, नाटयतन्त्र, सन्यासिणि।


**Phalakam-4 (Unit-4): संस्कृतवादित्यम् (Sanskrit Literary Works)**

- अभिज्ञानशृङ्खला, मेधदृढम्, क्रीमज्ञानम्, भानुरीक्रिया, नीतिचतुर्व, हितीदेशा।

Abhijnānaśākuntalam, Meghadūtam, Śrimadbhagavadgitā, Nitiṣatakam of Bhartṛhari, Hitopadesa.
PGQP15

Entrance Test for the Course(s): M.A. (Sociology) [CUGUJ], [CUHAR], [CUPUN], [CUSBR]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following syllabus:

**Basic Concepts in Sociology**
UNIT – I: Sociology: Definition, nature and scope; Relationship with other Social Sciences: Psychology, Anthropology, History, Economics, Political Science.
UNIT – III: Status and Role: Types of status and role and their interrelation
UNIT – IV: Socialization: Meaning, types, processes and agencies. Theories of self (Freud, Cooley and Mead) Culture: Meaning, characteristics; material and non-material culture; cultural lag; culture and civilization.

**Social Process and Problems**
UNIT – II: Social Groups: Definition, characteristics, types (primary and secondary; in-group and out-group; Reference group and Peer group).
UNIT – III: Social Institutions: Marriage; Family; Kinship; Education; Religion and economy (Meaning and functions) and Religion: Meaning and Functions.

**Society, Culture and Social Change**
UNIT – IV: Social Stratification: types, theories of stratification and mobility and its types
Indian Society
UNIT – I: Evolution of Indian Society: Traditional bases of Indian Society; Unity and Diversity in India; India as a Pluralistic Society.

UNIT – II: Caste, theories and Caste system and its Changing Dimensions in India and Dominant caste.


Social Research
UNIT – I: Social Research: Definition, Nature and purpose; Steps in Social Research; Problem of Objectivity and Subjectivity in Social Research

UNIT – II: Research Method: Research Designs; Social Survey; Hypothesis- Types & significance; Sampling and Sampling Procedure

UNIT – III: Techniques of Data Collection: Types of Data; Techniques- Observation, Interview, Questionnaire, Schedule and Case Study


Social Problems in India
UNIT – I: Social Problem: Meaning and Definition; Importance of the Study of Social Problems; Sociological Perspectives on Social Problem-Anomie and suicide (Durkheim) Labeling (Becker).

UNIT – II: Structural Issues: Inequality of Caste, Class Gender and Ethnicity; Communalism; Problems of Minorities.

UNIT – III: Problems and Issues: Female Foeticide, Dowry, Domestic Violence, Divorce; Problems of Aged.

UNIT – IV: Social Disorganization: Crime and Juvenile Delinquency, Corruption, Drug Addiction, Suicide, nepotism, Prostitution and AIDS
Social Change and Development
Unit –I: Social Change: Concept, Forms and Factors.; Theories of Social Change: Linear (Spencer), Cyclical (Pareto), Fluctuation (Sorokin); Conflict Theory (Marx).

Unit –II: Social Change in Contemporary India: Trends and Processes of Change – Sanskritisation, Westernization, Modernization and Secularization

Unit – III: Development Programmes in India: Development Programme in India; The Five Year Plans, Community Development Programme, , Panchayat Raj; Impact of new Panchayati Raj on Women Empowerment.

Unit– IV: Concept and Features of Development.

Foundations of Social Thought

UNIT – II: Functionalism: Durkheims’ Concept of Social Fact, Division of labour in Society; Radcliffe Brown’s Structural-Functional Approach.

UNIT – III: Conflict: Marx’s concept of Dialectical Historical Materialism, Class & Class Conflict; Coser’s Approach to Social Conflict.


Rural Society: Structure and Change

UNIT – II: Rural Social Structure: Caste and Class in Rural Set Up, Inter Caste Relation with reference to Jajmani System; Rural family and changing pattern.

UNIT – III: Rural Economy: Land Tenure System, Land Reforms; Green Revolution and Its Impact; Bonded and Migrant Labourers; Major Changes in Rural Society.

UNIT – IV: Rural Political Structure: Traditional Caste and Village Panchayats; Panchayati Raj before and after 73rd Constitutional Amendment, Panchayati Raj and Empowerment of Women.

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Entrance Test for the Course(s): M. Tech. (Transport Science and Technology) [CUJHD]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following syllabus:

I. Engineering Mathematics: Linear algebra, calculus, ordinary differential equation, partial differential equation, probability and statistics, numerical methods

II. Transportation Engineering: Highway alignment and engineering surveys, Geometric design of highways, railway track, airport runway length, and taxiway. Highway materials-desirable properties, factors affecting flexible and rigid pavements; Traffic studies on flow, speed, travel time - delay and O-D study, PCU, peak hour factor, parking study, accident study and analysis, statistical analysis of traffic data.

III. Construction Technology and Management: Construction Materials: Structural steel - composition, material properties and behavior, concrete constituents, mix design, short-term and long-term properties, bricks and mortar; timber, bitumen. Construction Management: Types of construction projects, tendering and construction contracts.

IV. Surveying: Principles of surveying: errors and their adjustments, Maps - scale, coordinate system, Distance and angle measurement - Levelling and trigonometric levelling, Traversing and triangulation survey, Total station, horizontal and vertical curves.

V. Geotechnical Engineering: Classification of soils, Effective stress principle, Permeability and Compressibility of soils, Seepage and flow nets, shear strength of soils, compaction of soils. Earth pressure theories, different earth retaining structures, Shallow and deep foundations: Terzaghi’s bearing capacity theory, Load carrying capacity of piles, Foundation design; Stability of slopes. Different tests on soil.

VI. Environmental Engineering: Population Forecasting and Water Demand, Physical, Chemical and Biological Characteristics of Water and Wastewater, Wastewater Flow, Sewerage system and sewer design. Introduction to Environmental Chemistry, Equilibrium Constant and Solubility Products, pH and Alkalinity. Flow sheets for Water and Wastewater Treatment, Municipal Solid Wastes, introduction to Solid Waste, Air Pollution and Noise Pollution.

VII. Solid Mechanics: Bending moment and shear force in statically determinate beams, Simple stress and strain relationships, theories of failures, simple bending theory, flexural and shear stresses, shear centre, uniform torsion, buckling of column, combined and direct bending stresses.
**PGQP17**

**Entrance Test for the Course(s):** M.Sc. (Geography) [CUHAR], [CUTND]. M.A./ M.Sc. (Geography) [CUJHD], [CUPUN]

1. **PART-A** will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. **PART-B** will consist of **75 objective questions** (MCQs) from the following syllabus:

**Unit-I:** Physical Geography: Lithosphere

The nature and scope of Physical Geography. Solar system and the Earth; Origin of the earth - important theories - Nebular, Tidal, Planetesimal, Supernova and Otto Schmidt.

The constitution of the earth’s interior, Age of the earth, Geological time scale. Origin of the Continents and Oceans: Wegner’s theory. Plate tectonics and Earth surface configuration, major and minor plates of the world and types of plate margins.

Major second order Land forms: Mountains, Plateaus, Plains and Lakes their classification and distribution.

Earth’s Materials: Rocks- their origin, classification and characteristics, Formation of regolith and soil.

**Unit-II:** Elements of Geography


**Unit-III:** The nature and scope of cartography. Types of Maps and Scientific method of letter writing. Scale: Statement scale, Representative Fraction (R.F.) and Graphical scale.

Construction of Graphic / Linear Scale: Simple, Comparative, Diagonal and Time scale.

Enlargement and reduction of Maps: Graphical – Square & Similar Triangle Method; Mechanical methods.

Identification of different rocks: Igneous, Sedimentary and Metamorphic Granite, Basalt, Pegmatite, Conglomerate, Sandstones, Limestone, Marble, Gneiss Schist, Slate 2.


Unit-V: Human Geography
Nature and scope of human Geography. Division of Mankind into racial groups their characteristics and distribution. Human Adaptation to the environment (i) Cold region- Eskimo (ii) Hot region- Bushman, Badawins (iii) Humid region-Pigmy

Human adaptation to the environment (i) Plateau-Gonds, Massi (ii) Mountain- Gujjars nomads, (iii)Regions of recurrent floods, droughts and other cultural hazards, Adaptation in modern society.


Migration- internal and international, Settlements-rural and urban, patterns and world distribution.

Population conflict resolution in developed and developing world. Geo-political conflicts. Frontiers and Boundaries, Indian ocean and World politics.

Unit-VI: Diagrammatic Representation of geographical data-types of diagram’s, bar and column charts. Simple Line graph and Compound graph.

Methods of showing relief- (Hachure, Shading, and Contours). Representation of different landforms by contours. Contours interpolation. Drawing of profiles cross and long profiles and their relevance in landforms mapping and analysis.

Surveying- Basic principles of surveying; Types of surveying, surveying by chain and tape: one and two base lines (Tie line).

Unit-VII: Physical Geography: Climatology
Definition and significance of climatology. Elements of weather and climate, composition and structure of the atmosphere.


Air masses and Fronts- Origin, classification and characteristics. Atmospheric disturbances: Cyclone-Tropical cyclone, temperate cyclone-theories of their origin and associated weather conditions.


**Unit-VIII:** Economic Geography


Fuel and Power resources of the world, world distribution and production of coal, petroleum and hydroelectric power. World potential and development of atomic energy and non-conventional sources of energy.

**Unit-IX:** Representation of Temperature pressure and Rainfall data, Line and Bar graph, Isotherm, Isobars and Isohyets.

Representation of statistical data - Circle diagram, Sector diagram, Age and Sex pyramid.

Classification of Indian Meteorological Observatories and method of collection of weather data. Construction and significance of Climograph and Hythergraph.

**Unit-X:** Physical Geography: Oceanography

Significance of Oceanography, surface configuration of the ocean floor, Hypsographic curve -continental self, continental slope, abyssal plain, trenches and deeps. Relief of Atlantic, Pacific, and Indian Oceans with illustration.

Distribution of Temperature and Salinity of oceans and seas and their importance to human life with special reference to activities of costal areas Circulation of oceanic waters, waves and currents, currents of Atlantic, Pacific and Indian oceans.

Tides –Causes, Types and Theories. Marine deposits- Coral reefs-types and their formation, theories of coral reefs formation, costal environment, ocean as store house of resources for the future.

**Unit-XI:** Economic Geography

Mining economy: Factors governing the exploitation of minerals. World reserves and production of Iron ore, Manganese, Bauxite and Copper.

Manufacturing industries- factors affecting location, growth and distribution of Iron and steel industry in USA, Russia, Great Britain and Germany. Factors affecting location, Growth and distribution of Cotton textile industry in USA, Great Britain, China, Japan. Woollen textile industry - location and world distribution.
Nature and trends in the International trade, World trade of wheat, cotton, tea, coffee, petroleum, gold, silver, gems and jewellery, etc.

Transport: Relative significance of different means of transport, factors affecting land, water and air transport. World oceanic routes; important inland waterways and important canals. Impact of globalization on world economy.

**Unit-XII**: Representation and analysis of Relief: Profile, Serial, Longitudinal, Superimposed composite, projected and their use in landform analysis,

Use of Meteorological instruments: Maximum and minimum Thermometer, Dry and Wet Bulb Thermometer, Fortin’s Barometer, Aneroid Barometer, Rain Gauge, Wind Vane, Anemometer. Weather maps: Preparation of weather maps in India; Symbols used in weather maps; Interpretation of Indian daily Weather maps published by the Indian Meteorological Department.

Survey- Prismatic compass survey, Radiation and Inter-section methods.

**Unit-XIII**: Geography of India: Physical Aspects
Locational characteristics; land of diversities and unity in diversity; Physical features relief and physiographic character. Drainage pattern. Climate : origin of monsoon, regional and seasonal variation.


Power resources: Coal, Petroleum, Hydroelectric power. Development of power resources; Sources of non-conventional energy. Water resources: availability, utilization, conservation methods- rain harvesting and watershed management.

**Unit-XIV**: Resources & Environment
Meaning, nature and components of resources and environment. Resources and environment interface.
Classification of resources - renewable and non-renewable, biotic and abiotic resources.

Water resources their economic and environmental significance and conservation methods. Minerals and energy resources their economic and environmental significance and conservation.

Types and distribution of forests - their economic and environmental significance and conservation.
Major soil types and their distribution, problems of soil erosion and soil conservation.

Fisheries- their economic and environmental significance and conservation.

**Unit-XV**: General principles and classification of Projections: Construction, Properties, limitations and uses of following projections: Zenithal: Gnomonic, Stereographic and Orthographic projections (Polar cases).

Conical projections: One standard parallel, Two standard parallels, Bonne’s and Polyconic. Simple cylindrical projection, Equal area cylindrical projection.

Mapping Techniques: Mapping of population data, Social, Economic and Physical Data employing Dot, Isopleth, and Choropleth method.
**Unit-XVI: Geography of India: People and Economy**
Cultural landscape: Population distribution and density, and its growth, urbanization.
Changing nature of Indian economy; Agriculture: Major crops- wheat, rice, cotton, tea; impact of green revolution, Regionalization of Indian agriculture.

Industrial development-location and distribution of iron and steel, cement, cotton textile and sugar industry.

International trade; Socio-economic development-impact of development on environment and globalization. Geography of Madhya Pradesh: Physical features, Climate, Forests, Power resources, Agriculture and Industries.

**Unit-XVII: Resources and Environment**


Impact of Human activities: deforestation, mining, agriculture and industrialization on environment. Environmental conservation, preservation, and sustainable resource use.

**Unit-XVIII: Statistical Methods**
Measures of central tendency- Mean, Median, and Mode; Standard Deviation.

Topographic maps: classification and numbering; Interpretation of physical and cultural topographic sheets. Aerial photograph and remote sensing & GIS.

Surveying: Plane Table survey by intersection, and Resection methods. One day field excursion visit of any specific geographical unit & their report/village survey report.

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Entrance Test for the Course(s): M.Sc. (Geo-informatics) [CUJHD], (Applied Geography & Geo-informatics) [CUKNK]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

**Human Geography**
- Definition, Nature, Major Subfields, Contemporary Relevance.
- Space and Society: Cultural Regions; Race; Religion and Language
- Population: Population Growth and Demographic Transition Theory.
- World Population Distribution and Composition (Age, Gender and Literacy).
- Settlements: Types and Patterns of Rural Settlements; Classification of Urban
- Settlements; Trends and Patterns of World Urbanization

**General Cartography**
- Maps – Types, Elements and Uses
- Map Scale – Types and Application, Reading Distances on a Map.
- Representation of Data – Symbols, Dots, Choropleth, Isopleth and Flow Diagrams, Interpretation of Thematic Maps.

**Environmental Geography:**
- Concepts and Approaches; Ecosystem – Concept and Structure; Ecosystem Functions.
- Human-Environment Relationship in Equatorial, Desert, Mountain and Coastal Regions.
- Environmental Problems and Management: Air Pollution; Biodiversity Loss; Solid and Liquid Waste.
- Environmental Programmes and Policies: Developed Countries; Developing Countries.
- New Environmental Policy of India; Government Initiatives.

**Geography of India**
- Physical Setting – Location, Structure and Relief, Drainage, Climate.
- Settlement System – Rural Settlement Types and Patterns, Urban Pattern.
- Resource Base – Livestock (cattle and fisheries), Power (coal, and hydroelectricity), Minerals (iron ore and bauxite).
- Economy – Agriculture (Rice, Wheat, Sugarcane, Groundnut, Cotton); Industries (Cotton Textile, Iron- Steel, Automobile), Transportation Modes (Road and Rail).

**Economic Geography**
- Definition, Approaches and Fundamental Concepts of Economic Geography; Patterns of Development.
• Locational Theories – Agriculture (Von Thunen) and Industrial (Weber).
• Primary Activities – Intensive Subsistence Farming, Commercial Grain Farming, Plantation, Commercial Dairy Farming, Commercial Fishing, and Mining (iron ore, coal and petroleum).
• Secondary Activities – Cotton Textile Industry, Petro-Chemical Industry, Major Manufacturing Regions.
• Tertiary and Quaternary Activities – Modes of Transportation, Patterns of International Trade, and Information and Communication Technology Industry.

Disaster Management
• Hazards, Risk, Vulnerability and Disasters: Definition and Concepts.
• Disasters in India: (b) Causes, Impact, Distribution and Mapping: Earthquake, Tsunami and Cyclone.
• Human induced disasters: Causes, Impact, Distribution and Mapping.
• Response and Mitigation to Disasters: Mitigation and Preparedness, NDMA and NIDM; Indigenous Knowledge and Community-Based Disaster Management; Do’s and Don’ts During Disasters

Geography of Tourism
• Concepts, Nature and Scope; Inter-Relationships of Tourism, Recreation and Leisure; Geographical Parameters of Tourism by Robinson.
• Type of Tourism: Nature Tourism, Cultural Tourism, Medical Tourism, Pilgrimage
• Recent Trends of Tourism: International and Regional; Domestic (India); Eco-Tourism, Sustainable Tourism, Meetings, Incentives, Conventions and Exhibitions (MICE)
• Impact of Tourism: Economy; Environment; Society
• Tourism in India: Tourism Infrastructure; Case Studies of Himalaya, Desert and Coastal and Heritage; National Tourism Policy

Sustainability and Development
• Sustainability: Definition, Components and Sustainability for Development.
• The Millennium Development Goals: National Strategies and International Experiences
• Sustainable Development: Need and examples from different Ecosystems.
• Inclusive Development: Education, Health; Climate Change: The role of higher education in sustainability; The human right to health; Poverty and disease; Sustainable Livelihood Model; Policies and Global Cooperation for Climate Change
• Sustainable Development Policies and Programmes: Rio+20; Goal-Based Development; Financing for Sustainable Development; Principles of Good Governance; National Environmental Policy, CDM

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Entrance Test for the Course(s): M.Sc. (Geology) [CUKER], [CUPUN], [CUSBR], [CUTND], (Applied Geology) [CUKNK]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following syllabus:

UNIT-I


Structural Geology: Introduction to Structural Geology: contours, topographic and geological maps; Elementary idea of bed, dip and strike; Outcrop, effects of various structures on outcrop. Clinometer/Brunton compass and its use. Elementary idea of types of deformation; Folds: nomenclature and types of folds. Faults: nomenclature, geometrical and genetic classifications, normal, thrust and slip faults. Definition, kinds and significance of joints and unconformity.


Physical Geography: –
1. Definition and Scope, Components of Earth System.
3. Lithosphere – Internal Structure of Earth based on Seismic Evidence, Plate Tectonics and its Associated Features.
5. Hydrosphere – Hydrological Cycle, Ocean Bottom Relief Features, Tides and Currents

**Fundamentals of Remote sensing & GIS:** Remote sensing systems; remote sensing sensors; signatures of rocks, minerals and soils. Application of remote sensing in geoscience and geomorphological studies. Types of Indian and Foreign Remote Sensing Satellites, Digital image processing; fundamental steps in image processing; elements of pattern recognition and image classification. Introduction to Geographic Information System (GIS); components of GIS; product generation in GIS; tools for map analysis; integration of GIS with remote sensing.

**UNIT-II**

**Crystallography:** Crystals and their characters, form, face, edge, solid angle; Interfacial angle and their measurements; Crystallographic axes and angles. Crystal parameters, Weiss and Miller system of notations. Symmetry elements and description of normal class of Isometric, Tetragonal, Hexagonal, Trigonal, Orthorhombic, Monoclinic and Triclinic systems.

**Mineralogy:** Introduction to Mineralogy, Definition and characters of mineral. Physical properties of minerals. Chemical composition and diagnostic physical properties of minerals such as: Quartz, Orthoclase, Microcline, Hypersthene, Hornblende, Garnet, Muscovite, Biotite, Chlorite, Olivine, Epidote, Calcite. Polarizing microscope, its parts and functioning; Ordinary and polarized lights; Common optical properties observed under ordinary, polarized lights and crossed nicols. Optical properties of some common rock forming minerals (Quartz, Orthoclase, Microcline, Olivine, Augite, Hornblende, Muscovite, Biotite, Garnet, Calcite).

**Geochemistry:** Introduction to geochemistry; basic knowledge about crystal chemistry. Types of chemical bonds, coordination number; Colloids in geological systems, ion exchanges and geological evidence for earlier colloids. Elementary idea of Periodic Table. Cosmic abundance of elements; Composition of the planets and meteorites; Geochemical evolution of the earth and geochemical cycles. Gold Schmidt's geochemical classification of elements; Distribution of major, minor and trace elements in igneous, metamorphic and sedimentary rocks. Elements of geochemical thermodynamics; Isomorphism and polymorphism.

**Petrology:** *Igneous Petrology*: Magma: definition, composition, types and origin; Forms of igneous rocks; textures of igneous rocks. Reaction principle; Differentiation and Assimilation; Crystallization of unicomponent and bicomponent (mix-crystals) systems; Bowen’s reaction series. Mineralogical and chemical classification of igneous rocks. Detailed petrographic description of Granite, Granodiorite, Rhyolite, Syenite, Phonolite, Diorite, Gabbro. Processes of formation of sedimentary rocks; Classification, textures and structures of sedimentary rocks. Petrographic details of important siliciclastic and carbonate rocks such as - conglomerate, breccia, sandstone, greywacke, shale, lime stones. Process and products of metamorphism; Type of metamorphism. Factors, zones and grades of metamorphism. Textures and structures of metamorphic rocks.Classification of metamorphic rocks. Petrographic details of some important metamorphic rocks such as - slate, schists, gneiss, quartzite, marble.

**Economic Geology:** Concept of ore and ore deposits, ore minerals and gangue minerals; Tenor of ores; Metallic and non-metallic ore minerals; Strategic, Critical and essential minerals. Processes of formation of ore deposits; Magmatic, contact metasomatic, hydrothermal, sedimentation.Study of important metallic (Cu, Pb, Zn, Mn, Fe, Au, Al) and non-metallic (industrial) minerals (gypsum, magnesite, mica). Distribution of coal and petroleum in India.
**Mineral exploration:** Elementary idea of geological, geochemical and geophysical prospecting. Elementary idea of mining and environmental considerations for mining.

**Stratigraphy:** Definition, Principle of stratigraphy; Geological Time Scale and stratigraphic classification; Physiographic division of India. Study of following Precambrian succession: Dharwar, Cuddapha, Vindhyan and Delhi Supergroups; Brief idea of Palaeozoic succession of northwestern Himalaya; Triassic of Spiti; Mesozoic type succession of Kutch and Rajasthan; Cretaceous of Tiruchirapalli. Study of following type localities: Gondwana and Deccan Trap. Palaeogene-Neogene sequences of northwest Himalaya and Assam.


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PGQP20

Entrance Test for the Course(s): M.A. (Social Work) [CUGUJ], [CUJAM], [CUSBR], MSW (Social Work) [CUKER], [CUKNK], [CURAJ], [CUTND], (Tribal Welfare and Justice) [CUJHD]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following syllabus:

Unit – I: Social concepts: family, marriage, neighborhood, community, organization, culture, caste, clan, values, culture, traditions, practices, norms, lifestyle, health, socialization, needs.

Unit – II: Economic concepts: economy, market, production, distribution, demand, supply, labor, income, expenditure, globalization, privatization, liberalization, industrialization.


Unit – IV: Psychological concepts: individual, self, behavior, mental functions, attitude, emotions, beliefs, self-esteem, intelligence.

Unit – V: Environmental concepts: environment, atmosphere, pollution-air, water, sound; natural resources - air, water, soil, forest; disaster.

Unit- VI: Legal concepts: constitution, law, petition, litigation, First-hand information report (FIR).

Unit – VII: Social reform, social movement, social work: Concepts: social reform, social movement, revolution, satyagraha, non-violence, truth, justice, peace, social work, social development;

   Bhakti movement – Guru Nanak, Kabir, Basaveshwar;

   Social reformers – Rajaram Mohan Roy, Swami Vivekanand, Dhondo Singh Karve;

   Freedom movement – Gandhi, Subhaschandra Bose;

   Dalit & Social movement – Ambedkar, Medha Patkar, Anna Hazare, Aaruna Roy; Non-government organizations, Corporate.

Unit – VIII: Social change and Social transformation: Concepts: social change, social transformation.


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PGQP21

Entrance Test for the Course(s): M. Arch. (Sustainable Architecture) [CURAJ]

1. **PART-A** will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. **PART-B** will consist of **75 objective questions** (MCQs) from the following syllabus:

I. Mathematics (basic understanding as applicable for sustainable architecture)

II. General awareness about Ecology, Environment, Climate Change, Renewable energy.

III. Vernacular, Traditional and Recycled Materials in context of Sustainable Architecture.

IV. Contemporary and famous examples of sustainable / energy efficient architecture / settlement planning across the world.

V. Climatology and Climate Responsive Architecture – Vernacular, Traditional and Modern.

VI. Building Services and Utilities – Electrical, HVAC, Sanitary and Plumbing, Solid and Liquid Waste Management (with special reference to energy efficiency, recycling and re-use).

VII. Water Conservation, harvesting and recharge – Traditional and Modern Methods.

VIII. Overview of Green Buildings rating systems.

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PGQP22

Entrance Test for the Course(s): M.Sc. (Life Science) [CUGUJ], [CUJHD], [CUKNK], [CUSBR], (Microbiology) [CUHAR], [CUPUN], [CURAJ], [CUTND], (Biochemistry) [CUHAR], [CUKER], [CUPUN], [CURAJ], (Nutrition Biology) [CUHAR], (Biotechnology) [CUHAR], [CURAJ], [CUSBR], (Zoology) [CUKER], [CUPUN], (Genomic Science) [CUKER], (Bioinformatics) [CUPUN], [CUSBR], (Botany) [CUPUN], [CUKER], (Life Sciences (Sp. in Human Genetics)) [CUPUN], (Life Sciences (Molecular Medicine)) [CUPUN]

1. **PART-A** will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. **PART-B** will consist of **75 objective questions** (MCQs) from the following syllabus:

1. Techniques: Principles and applications of chromatography, spectroscopy, microscopy, electrophoresis, centrifugation, blotting, PCR & radioisotope techniques.

2. Chromatin structure and function: Organization of chromosomes in prokaryotes and eukaryotes, chromatin types, centromere, Telomere and concept of gene.


4. Biotechnology: Recombinant DNA technology, principles of gene cloning, applications of biotechnology in medicine, industry and agriculture, animal & plant cell culture, environmental biotechnology.

5. Microbiology: Diversity of microbes, bacterial reproduction, antimicrobial agents, significance of microbes in the industry and agriculture, antigen, antibody, complement systems, immunity, vaccines, plant virus, animal virus and environmental microbiology.


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PGQP23

Entrance Test for the Course(s): M.A. (Telugu) [CUAPH]

1. PART-A will consist of 25 **objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 **objective questions** (MCQs) from the following syllabus:

   1. చరిత్ర చర్చ పరిస్థితులు – లోహి – లోతుల

      చరిత్ర చర్చ పరిస్థితులు (చర్చ మారంభం), ముందల మారంభం, మారంభం మారంభం, మిని

      పరిస్థితుల
   
   2. ఆస్థా చర్చ పరిస్థితులు

      మిని పరిస్థితులు – వనరుల, వన, వనరుల, మార్పుల, మార్పుల.

      మార్పుల పరిస్థితులు – వనరుల, వనాల, వనరుల, మారంభం మారంభం,

      మారంభం

      మారంభం, వనరుల కల వనరుల, మారంభం మారంభం, మారంభం మారంభం,

      వనరుల పరిస్థితులు.
   
   3. సాంస్కృతిక పరిస్థితులు

      కీల విశేష పరిస్థితి మారంభ
   
   4. మ్యాట్స్ పరిస్థితులు

      మ్యాట్స్ చరిత్ర పరిస్థితులు, మ్యాట్స్ చరిత్ర పరిస్థితులు – కీల, కీల విశేష మారంభ పరిస్థితులు

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Entrance Test for the Course(s): M.Pharm. (Pharmaceutical Chemistry) [CUPUN], [CURAJ], (Pharmaceutics) [CURAJ], [CUSBR], (Pharmacology) [CUHAR], [CUPUN], [CUSBR], (Pharmacognosy) [CUPUN]

1. PART - A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART - B will consist of **75 objective questions** (MCQs) from the following syllabus:

**PHARMACEUTICS-I (INTRODUCTION TO PHARMACEUTICS)**
1. History of pharmaceutical practice through ages, pharmacy as a career.
3. Routes of administration and classification of pharmaceutical dosage forms.
4. Definition, general formulation, manufacturing procedures and official products of following categories: Aromatic waters, solutions, syrups, spirits, elixirs, linctuses, lotions, liniments, glycerites, gargles, mouth washes, inhalations, milk and magmas, mucilages, jellies, infusion, decoctions, tinctures and extracts.
5. Methods employed in the preparation of plant extracts.
7. Emulsions: Types of emulsion, theories of emulsification (monomolecular adsorption multimolecular adsorption and film formation and solid-particle adsorption), physical stability of emulsions, creaming and Stoke’s law, coalescence and breaking, phase inversion, evaluation of emulsion and pharmaceutical applications.

**PHARMACEUTICAL CHEMISTRY-I (ORGANIC-I)**
2. Reaction intermediates: Transition states, rearrangement, carbanions, carbocations, carbon radicals, carbenes, nitriles and benzyne.
3. Stereochemistry: Stereoisomerism, enantiomers, elements of symmetry, chirality, racemic modification, configuration, specification of configuration, sequence rule, conformational isomers, reactions involving stereoisomer’s, asymmetric synthesis.
4. Study of reaction mechanism, reactivity and orientation, effect of substituent groups of following categories of reactions:
4.1. Addition reactions: (a) Nucleophilic addition reactions: Nucleophilic addition to C=O, addition of cyanides, derivatives of ammonia, alcohols, Grignard’s reagent, Aldol condensation, nucleophilic addition to C=C, C≡C. (b) Electrophilic addition reactions: Addition of hydrogen, halogen, hydrogen halide, sulphuric acid, water, halohydrin formation, dimerisation, alkanes, oxymercuration-demercuration, hydroboration-oxidation, stereoselective and stereospecific reactions, comparison of nucleophilic and electrophilic addition in alpha-beta unsaturated carbonyl compounds. (c) Free radical addition reactions: Peroxide initiated addition of HBr (antimarkonikov orientation).
4.2. Elimination reactions: 1, 2 Elimination reactions, dehydrohalogenation of alkyl halides, E1, E2, E1cb, E1 vs E2, elimination vs substitution.

4.3. Substitution reactions: (a) Free radical substitution: Halogenation of alkanes (b) Nucleophilic Aliphatic: SN1, SN2, SN1 vs SN2, neighboring group effect (c) Nucleophilic Acyl substitution: Esterification reactions, conversion to acids, acid chlorides, amides, esters, nucleophilic substitution alkyl vs acyl. (d) Electrophilic aromatic substitution: Nitration, sulphonation, halogenation, Friedal Craft’s alkylation, electrophilic substitution in naphthalene. (e) Nucleophilic aromatic substitution: Bimolecular displacement, benzyne, and aliphatics aromatic substitution.

4.4. Condensation and rearrangement reactions: Claisen condensation, Reimer Tieman reaction, Hoffmans degradation of amides, Kolbe’s reaction, Fries rearrangement, Cannizaro’s reaction and coupling reaction.

PHARMACEUTICAL CHEMISTRY-II (INORGANIC)

1. The occurrence of impurities in pharmaceutical preparations: Types of impurities and limit test for chlorides, sulphate, arsenate, lead, heavy metals and iron.

2. A systematic study of the following pharmaceutical inorganic compounds with reference to their preparations, properties, tests for identity and purity, pharmaceutical uses and assay methods as given in Indian Pharmacopoeia (IP).

3. Group IA: Sodium and potassium compounds: Sodium benzoate, sodium bicarbonate, sodium borate, sodium chloride, sodium citrate, sodium fluoride, sodium metabisulphate, sodium phosphate, sodium potassium tartarate, potassium permanganate, potassium dichromate, potassium chloride, potassium bromide and potassium iodide. Group-IB: Copper, silver and gold compounds: Copper sulphate, silver nitrate, strong silver proteins, and mild silver proteins.


6. A study of major intra and extra cellular electrolytes, essential and trace elements and their physiological role.

7. Selected case studies in medicinal inorganic chemistry from the following topics: a. Biomedical uses of lithium b. Application of platinum compounds in medicine c. Gold (I) compounds as therapeutic agents d. Ruthenium, titanium and gallium compounds in medicine.
8. Metal compounds as contrast agents for MRI and medicinal applications of radio-active compounds.

**ADVANCE MATHEMATICS**

1. Differential equations and its applications: Revision of integral calculus, definition and formation of differential equations, equations of first order and first degree, variable separable, homogeneous and linear differential equations and equations reducible to such types, linear differential equations of order greater than one with constant coefficients, complementary function and particular integral, simultaneous linear differential equations, pharmaceutical applications.

2. Laplace transforms: Definition, transforms of elementary functions, properties of linearity and shifting, inverse Laplace transforms, transforms of derivatives, solution of ordinary and simultaneous differential equations.

3. Biometrics: Significant digits and rounding of numbers, data collection, random and nonrandom sampling methods, sample size, data organization, diagrammatic representation of data, bar, pie, 2-D and 3-D diagrams, measures of central tendency, measures of dispersion, standard deviation and standard error of means, coefficient of variation, confidence (fiducial) limits.

4. Probability: Probability and events, Baye’s theorem, probability theorems, probability distributions, elements of binomial and poison distribution, normal distribution curve and properties.

5. Correlation and regression analysis: Method of least squares, statistical inference, student’s and paired t-test, f-test and elements of ANOVA, kurtosis and skewness, applications of statistical concepts in Pharmaceutical Sciences.

**PHARMACEUTICS-II (PHYSICAL PHARMACY)**


2. Micromeritics: Particle size and size distribution: Average particle size, Number and weight distribution, Particle number, Methods for determining particle size, Optical microscopy, Sieving, Sedimentation, Particle volume measurement, Particle shape and surface area, Methods for determining surface area, Derived properties of powders, Porosity, Packing arrangements, Densities of particles, Bulkiness, Flow properties.


5. Dispersed systems: Colloids, Types of colloidal systems, Optical properties of colloids, Kinetic properties of colloids, Electrical properties of colloids, Pharmaceutical applications of colloids.
6. Complexation and protein binding: Classification of complexes, Methods of preparation and analysis, Pharmaceutical applications, Protein binding, Factors affecting complexation and protein binding.

7. Chemical kinetics: General considerations and concepts, Half-life determination, Factors affecting rate of reaction, Order of reaction, Determination of order of reaction.

PHARMACEUTICAL CHEMISTRY-III (ORGANIC-II)

1. Nomenclature of heterocyclic compounds: Trivial names, Systematic (Hantzch-Widman) nomenclature of monocyclic compounds, Naming of fused ring systems (biand tricyclic systems).
2. Classification of heterocyclic compounds: Monocyclic, bicyclic and tricyclic systems.
3. Chemistry, preparation, properties and pharmaceutical applications of following heterocyclic rings:
   3.1 Monocyclic rings
       3-membered with one hetero atom: Aziridine,
       4-membered with one hetero atom: Azetidine
       5-membered with one hetero atom: Pyrrole, Thiophene, Furan,
       5-membered with two or more hetero atoms: Imidazole, Pyrazole, Oxazole, Isoxazole, Thiazole, Isothiazole, Triazole, Tetrazole Oxadiazole, Thiadiazole.
       6-membered with one hetero atom: Pyridine, Pyran,
       6-membered with two or more hetero atoms: Pyrimidine
   3.2 Bicyclic rings –
       5-membered with one hetero atom: Indol
       5-membered with two or more heteroatoms: Benimidazole, Benzopyrazole, Benzoxazole, Benzothiazole, Benzofuran
       6-membered with one hetero atom: Quinoline, Isoquinoline, Coumarin
       6-membered with two or more hetero atoms: Purine, Quinazoline
   3.3 Tricyclic rings: Acridine
5. Applications of reagents used in organic syntheses: Aluminium chloride, Boron trifluoride, Grignard reagent, Phosphorus pentachloride, Thionyl chloride, n-Bromosuccinimide, Raney nickel, Platinum, Palladium, Lead tetra acetate, Osmium tetroxide, Aluminium t-butoxide, Jones reagent, Lithium aluminium hydride, Sodium borohydride, Stannous chloride, Aluminium isopropoxide, Diazomethane, Dicyclohexyl carbodimide, Ozone, Polyphosphoric acid, Sodamide, Sodium azide, Sodium hydride.
6. Oxidation and hydrogenation/reduction: Types of oxidative reactions and oxidizing reagents, Homogenous and heterogeneous hydrogenation.
PHARMACEUTICAL MICROBIOLOGY
1. Introduction and scope of microbiology.
2. Classification of microbes and their taxonomy: Bacteria, Actinomycetes, Rickettsiae, Spirochetes and Viruses. Microbial genetics and variation.
5. Immunity, primary and secondary defensive mechanisms of body, microbial resistance, interferon.
6. Food spoilage and preservation of food.
7. Microbial assay of antibiotics, vitamins and amino acids.

ANATOMY PHYSIOLOGY & HEALTH EDUCATION-I
1. Scope of anatomy & physiology and basic terminology used in the subject.
3. Elementary Tissues of the Human Body: Epithelial, Connective, Muscular and nervous tissues their sub-types and characteristics.
5. Skeletal Muscles: Gross anatomy of muscles, physiology of muscle contraction, physiological properties of skeletal muscles.
6. Haemopoietic System: Composition and functions of blood and its elements, blood groups and their significance, mechanism and significance of blood coagulation.
8. Cardiovascular System: Basic anatomy and physiology of the heart, blood vessels and circulation, basic understanding of cardiac cycle, heart sounds and electrocardiogram, blood pressure and its regulation.
   a. Classification of food requirements, importance of balanced diet and nutritional, deficiency disorders; their treatment and prevention.
   b. Demography and family planning: Demography cycle, family planning and various contraceptive methods and medical termination of pregnancy.

PHARMACEUTICS-III (PHARMACEUTICAL ENGINEERING)
1. Unit Operations: Introduction to unit operations, law of material and energy balances, rate of a process, steady and unsteady states, equilibrium state, dimensionless equations, dimensionless formulae, dimensionless groups.
3. Size Reduction: Definition, objectives of size reduction, factors affecting size reduction, mechanisms of size reduction, laws governing energy and power requirements of a mill, ball mill, hammer mill, fluid energy mill and other mills in pharmaceutical industry, wet grinding, selection of size reduction method, selection of degree of size reduction.


8. Crystallization: Characteristics of crystals like purity, size, shape, geometry, habit, forms size and factors affecting them, solubility curves and calculation of yields, supersaturation theory and its limitations, nucleation mechanisms, crystal growth, study of various types of crystallizer, tanks, agitated batch, Swenson Walker, single vacuum, circulating magma and crystal crystallizer, caking of crystals and its prevention.

9. Refrigeration, Air Conditioning and Humidity Control: Principles and applications of refrigeration and air conditioning, basic concepts and definition of humidity, wet bulb and adiabatic saturation temperatures, psychrometric chart and measurement of humidity, application of humidity measurement in pharmacy, equipments for humidification and dehumidification operations.

10. Evaporation: Basic concept of phase equilibrium, factor affecting evaporation, different types of evaporators, single and multiple effect evaporators, evaporation under reduced pressure.

11. Distillation: Raoult's law, phase diagrams, volatility, simple steam and flash distillations, rectification, Mc. Cabe Thiele method for calculations of number of theoretical plates, azeotropic and extractive distillation.

12. Drying: Moisture content and mechanism of drying, rate of drying, classification and types of dryers, dryers used in pharmaceutical industries, special drying methods.


**PHARMACEUTICS I**

**(DISPENSING, COMMUNITY AND HOSPITAL PHARMACY)**

1. Prescription: Parts, types and handling of prescription, knowledge of commonly user Latin terms in prescriptions, general dispensing and compounding procedures, labeling of dispensed products, sources of errors in prescription, care required in dispensing of prescription.

2. Pharmaceutical calculations: Different systems of weights and measures, dilution and concentration of solutions, percentage solutions, calculation by allegation, proof spirits, isotonic solution, calculation for adjustment to isotonicity, posology, knowledge of prophylactic and therapeutic doses of commonly used drugs, detection of overdoses in prescription, calculation of doses for infants, adults and elderly patients.

3. Principle involved and procedures adopted in dispensing of mixtures, solutions, emulsions, lotions, liniments, powders, capsules, tablets, tablet triturates, pastilles, lozenges, pills, ointments, creams, pastes, suppositories, jellies, inhalations, paints, sprays and ophthalmic preparations.

4. Incompatibility: Physical, therapeutic and chemical incompatibilities, incompatibility of common occurrence and their correction.

5. Community pharmacy: Organization and structure of retail and whole sale drug store and design, legal requirements for establishment and maintenance of drug stores, dispensing of proprietary products, maintenance of records, patient counseling on rational use of drugs and aspects of health care.

6. Hospital pharmacy: Organization of a hospital pharmacy, responsibilities of a hospital pharmacist, pharmacy and therapeutic committee, hospital formulary, contents, preparation and revision of hospital formulary, inventory control procedures in hospital pharmacy.

**PHARMACEUTICAL ANALYSIS-I**

1. Theoretical aspects of quantitative analysis: Significance of quantitative analysis in quality control, different techniques of analysis, statistical treatment of analytical data, types of errors, mean deviation, standard deviation, accuracy and precision, significant figures, rules for retaining significant figures, methods of expressing concentration, primary and secondary standards.

2. Titrimetric techniques: Theoretical considerations and pharmaceutical applications with special
reference to Indian Pharmacopoeia of the following analytical techniques: Acid-Base titrations:
Acid base concepts, role of solvents, relative strengths of acids and bases, ionization, law of mass
action, common-ion effect, ionic product of water, pH, hydrolysis of salts, Henderson-Hasselbach
equation, buffer solutions, neutralization curves, acid-base indicators, theory of indicators, choice
of indicators, mixed indicators, universal indicators, polyprotic systems, preparation and standardization
of neutralization titrants.

Oxidation-Reduction titrations: Concepts of oxidation and reduction, redox reactions, strengths
and equivalent weights of oxidizing and reducing agents, theory of redox titrations, redox indicators,
oxidation-reduction titration curves, titrations involving potassium permanganate, ceric ammonium
sulphate, potassium iodate, potassium bromate, iodometry and iodimetry, pharmaceutical applications,
preparation and standardization of redox titrants like potassium permanganate, ceric ammonium
sulphate, potassium dichromate, potassium iodate, potassium bromate, iodine, sodium thiosulphate.

Precipitation titrations: Precipitation reactions, solubility products, detection of endpoint in precipitation
titrations, indicators used in precipitation titrations, preparation and standardization of titrants like silver
nitrate, ammonium and potassium thiocyanate, titrations according to Mohr’s and Volhard’s methods,
ammonium and potassium thiocyanate, applications in pharmaceutical analysis.

Gravimetric analysis: Fundamentals of gravimetry, precipitation reagents, precipitation techniques,
specific examples of gravimetric estimation like aluminium as hydroxyquinolate, barium as barium
sulphate, lead as chromate and magnesium as magnesium pyrophosphate.

Non-aqueous titrations: Scopes and limitations, solvents used in non-aqueous titrations, acid-base
equilibria in non-aqueous media, differentiating and leveling effect of solvents, preparation and
standardization of perchloric acid and tetrabutyl ammonium hydroxide, titration of weak acid and
weak bases with suitable examples.

Complexometric titrations: Theory of complexometric analysis, factors influencing stability of complexes,
metal ion indicators, types of disodium edetate titrations with suitable examples, preparation and
standardization of disodium edetate, methods to increase the selectivity of EDTA titrations.

PHARMACOGNOSY-I
1. Definition, history, scope and development of pharmacognosy, sources of crude drugs and methods
   of their classification.
2. Plant hormones and their applications, influence of mutation and hybridization with reference to
   medicinal plants.
3. Pest control and natural pest control agents.
4. Quality control of crude drugs: Different types of adulteration and their evaluation using various
   methods like organoleptic, microscopic, physical, chemical and biological.
5. An introduction of various types of primary and secondary metabolites as active constituents of crude
   drugs, general methods of their isolation, classification, properties and systematic pharmacognostic study
   of:
   a) Carbohydrates and drugs belonging to this class like: Agar, Guar Gum, Acacia, Isabgol, Pectin,
   Sterculia, Tragacanth.
   b) Lipids and drugs belonging to this like: Castor oil, Beeswax, Cocoa butter, Hydonocarpus oil, Kokum
   butter, Codliver oil, Woolfat.
   c) Resins and Tannins, and drugs of these classes like: Podophyllum, Balsams, Turmeric, Ginger, Ipomea
   and Myrobalan.
   d) Pharmaceutical aids like: Talc, Kaolin, Bentonite, Gelatin, Cotton and Viscose Rayon.
ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION – II

4. Endocrine System: Basic anatomy and physiology of pituitary, thyroid, parathyroid, adrenals, pancreas, testis and ovary; their hormones and functions.
5. Digestive System: Gross anatomy of gastrointestinal tract, functions of its different parts, various gastrointestinal secretions and their role in the absorption and digestion of food.
6. Reproductive System: Anatomy of male & female reproductive system and their hormones, physiology of menstruation, coitus, fertilization, sex differentiation, spermatogenesis and oogenesis, pregnancy its maintenance and parturition.
8. Sense Organs: Basic anatomy and physiology of the eye (vision), ear (hearing), tastebuds, nose (smell) and skin (superficial receptors).

PHARMACEUTICS - V (DOSSAGE FORM DESIGN)

1. Preformulation studies: Study of physical properties of drug like physical form, particlesize, shape, density, wetting, dielectric constant, solubility, dissolution and organoleptic property and their effect on formulation, stability and bioavailability. Study of chemical properties of drugs like hydrolysis, oxidation, reduction, racemization, polymerization etc. and their influence on formulation and stability of products. Biopharmaceutical consideration in the formulation stages of dosage form development.
2. Study of different types of formulation additives e.g., diluents, binders, disintegrants, lubricants, vehicles, anti-oxidants, preservatives, coloring, flavoring, sweetening, suspending and emulsifying agents. Drug-excipient interactions.
3. Stability studies: Determination of shelf life (expiry date) and overage calculations, stabilization and stability testing protocol for various pharmaceutical products.
4. Polymers: Classification, synthesis, properties, characterization and evaluation of polymers including biodegradable polymers, mechanism of biodegradation in body, pharmaceutical applications of polymers.
5. Dissolution technology: Types of various dissolution apparatus as per pharmaceutical compendia, dissolution media, factors affecting dissolution, dissolution testing of different types of dosage formulations, data interpretation, similarity and difference factors.

PHARMACEUTICAL ANALYSIS-II

1. Conductometry: Ohm’s law and ionic conductivities, instrumentation, conductometric titration curves, applications of conductometry in acid-base, redox, precipitation and complexometric titrations with suitable examples.
2. Potentiometry: Theory and principles, reference electrodes, indicator electrodes, instrumentation for potentiometric titrations, location of end point in potentiometry, application of potentiometry in acid-base, redox, precipitation and complexometric titrations with suitable examples.
3. Polarography: Principle, polarographic wave, illkovic equation and factors affecting it, dropping mercury electrode, instrumentation, polarographic methods of analysis, pharmaceutical applications.
4. Amperometry: Principle, amperometric titration curves, applications.
6. Radioimmunoassay: Principle, procedure, pharmaceutical applications.

PHARMACEUTICAL CHEMISTRY- IV (BIOCHEMISTRY)
1. Enzymes: Nomenclature and classification, structure of enzymes, mechanism of enzyme action, mode of enzyme action, factors affecting enzyme action, enzyme inhibition, regulation of enzyme activity, allosteric enzymes and pharmaceutical application.
2. Co-enzymes: Metals and vitamins as coenzymes and their significance.
3. Carbohydrates metabolism: Glycolysis, gluconeogenesis and glycogenolysis, citric acid cycle, pentosephosphate, pathway, uronic acid pathway, metabolism of galactose and galactosemia.
4. Lipid metabolism: Transportation and absorption of fats, role of liver in fat metabolism, oxidation of fatty acids, ketosis, biosynthesis of saturated and unsaturated fatty acids, control of lipid metabolism, essential fatty acids and eicosanoids, metabolism of cholesterol.
5. Biological oxidation: Redox potential, enzymes and co-enzymes involved in oxidation-reduction and its control, the respiratory chain, its role in energy capture and its control, energetic of oxidative phosphorylation, inhibitors of respiratory chain and oxidative phosphorylation, mechanism of oxidative phosphorylation.
6. Metabolism of ammonia and nitrogen containing monomers: Nitrogen balance, biosynthesis of amino acids, catabolism of amino acids, conversion of amino acids to specialized products, assimilation of ammonia, urea cycle, metabolic disorders of urea cycle, metabolism of sulfur containing amino acids, porphyrin biosynthesis, formation of bile pigment, hyperbilirubinemia, purine biosynthesis, purine nucleotide interconversion, pyrimidine biosynthesis, and formation of deoxyribonucleotides.

PHARMACOGNOSY II
1. Classification, cultivation, collection, commercial varieties, chemical constituents, substitutes, diagnostic macroscopic and microscopic features and specific chemical tests of following groups of drugs containing glycosides:
a. Saponins - Liquorice, ginseng, dioscorea, and senega.
b. Cardio active sterols - Digitalis, squill, strophanthus and thevetia.
c. Anthraquinone cathartics - Aloe, senna, rhubarb and cascara.
d. Others - Psoralea, ammi majus, ammi visnaga, gentian, saffron, chirata, and quassia.
2. Volatile oils: General method of obtaining volatile oils from plants, study of following volatile oil containing drugs as mentha, coriander, cinnamon, cassia, lemon grass, citronella, caraway, dill, clove, fennel, nutmeg, eucalyptus, chenopodium, cardamom, musk, palmosa, gultheria and sandal wood.
3. Plant bitters and sweeteners.
5. Biological sources, preparation, identification tests and uses of the following enzymes: Diastase, Papain, Pepsin, Trypsin and Pancreatin.

PHARMACEUTICAL JURISPRUDENCE & ETHICS
1. Introduction
a) Pharmaceutical Legislations – A brief review.
b) Drugs and pharmaceutical industry with
special reference to India.
c) Code of pharmaceutical ethics – A brief review.

2. An elaborate study of the following:
a) Pharmacy Act 1948.
b) Drugs and Cosmetics Act 1940 and Rules 1945.
c) Medicinal & Toilet Preparations (excise duties) Act 1955.
e) Drugs Price Control Order 1995.

3. A brief study of the following with special reference to the main provisions.
a) Poisons Act 1919.
b) Drugs and Magic Remedies (objectionable advertisements) Act 1954.
e) States Shops & Establishments Act & Rules.
f) Insecticides Act 1968.
g) AICTE Act 1987.
h) Factories Act 1948.

4. A brief study of the various marketed pharmaceutical products from the following categories: (i) Antibiotics (ii) Vitamins (iii) Antihypertensive (iv) Anti-diabetics (v) NSAIDs

PHARMACEUTICS- VI (COSMETIC TECHNOLOGY)
Fundamental of cosmetic science. Formulation considerations, preparation, packaging and evaluation of the following cosmetic preparation:
1. Face Preparation: Face powder, Compact powder, Talcum powder, Face packs and Masks.
2. Colored make-up preparations: Lipsticks, Rouge, Mascara and Eye-liner.
6. Hair Preparations: Hair tonics, Hair conditioners, Hair lotions, Hair sprays, Hairdressing, Hair setting lotions and creams, Hair dyes, bleaches, Hair waving, Hair straighteners and Hair strengtheners.
8. Manicure Preparation: Nail polish, Nail lacquers and Nail bleaches.
9. Herbal Cosmetics: Cosmetics containing Aloe, Babul, Brahmi, Chandan, Cucumber, Haldi, Jatamansi, Khus, Mehandi, Neem, Reetha, Shikakai, Tulsi, Arnica, Bhringraj And Volatile Oils.

PHARMACEUTICS-VII (PHARMACEUTICAL TECHNOLOGY-I)
1. Liquid Dosage Forms: Introduction, types of additives used in formulations, vehicles, stabilizers, preservatives, suspending agents, emulsifying agents, solubilizers, colors, flavors and others,
manufacturing, packaging and evaluation of clear liquids, suspensions and emulsions.


5. Solid Dosage Forms: Capsules: Advantages and disadvantages of capsules dosage form, material for production of hard gelatin capsules, size of capsules, methods of capsule filling and sealing, soft gelatin capsule, capsule shell and capsule content, importance of base absorption and minimum per gram factors in soft gelatin capsules, quality control, stability studies and testing of capsule dosage form.

6. Pharmaceutical aerosols: Definition, propellants, and general formulation, manufacturing and packaging methods and pharmaceutical applications.

7. A brief introduction of blood products, plasma substitutes and surgical products.

PHARMACEUTICAL CHEMISTRY-V (MEDICINAL CHEMISTRY-I)
1. Introduction and basic principles of Medicinal Chemistry: Historical perspectives of Medicinal Chemistry, Drug discovery, Physico-chemical, stereochemical (optical and geometrical) properties and bioisosterism in relation to biological action, receptors and drug action, theories and drug receptor interactive forces, Enzymes and drug action, Drug metabolism, Phase I and Phase II reactions Classification, synthesis of selective drugs, Structure activity relationship, pharmacological/biochemical mechanism of action, Therapeutic uses of following category of agents: (special emphasis should be given to specified drugs)

2. Drugs affecting neurotransmission:
   c. Drug acting on serotonergic neurotransmission: Neurochemistry and stereochemistry of Serotonin, Serotonergic agonists and antagonist agents.
   d. Local Anesthetic agents: Benzocaine, Procaine hydrochloride, Lignocaine hydrochloride, Bupivacaine hydrochloride, and Dibucaine hydrochloride.

3. Drugs affecting the Immune System:
   Non-steroidal anti-inflammatory agents, analgesics and anti-pyretic: Chemistry of inflammatory mediators, Prostaglandins, Leukotrienes and Thromboxanes (Asprin, Acetaminophen, Indomethacin,
Ibuprofen, Naproxen, Piroxicam, Phenylbutazone, Oxyphenbutazone and Celecoxib. Antihistamines, antiallergic and anti-ulcer agents: Neurochemistry and stereochemistry of histamine, Dual acting antihistaminics, H2 and H3 antagonists (Diphenhydramine Hydrochloride, Bromodiphenhydramine Hydrochloride, Chlorcyclizine Hydrochloride, Promethazine Hydrochloride, Phenindamine Tartrate and Chlorpheniramine Maleate).


PHARMACOGNOSY III
1. Systematic study of source, cultivation, collection, processing, commercial varieties, chemical constituents, substitutes, adulterants, uses, diagnostic macroscopic and microscopic features and specific chemical tests of following Alkaloid containing drugs:
   a. Tropane: Belladona, hyoscyamus, datura, coca and withania.
   b. Quinoline and isoquinoline: Cinchona, ipecac and opium.
   c. Indole: Ergot, rauwolfia, catharanthus, nux-vomica, physosiiigma.
   d. Steroidal: Veratrum and kurchi.
   e. Steroidal amine: Ephedra and colchicum.
   f. Purines: Coffee, tea and cola.
2. A brief account of plant-based industries and institutions involved in work on medicinal and aromatic plants in India, utilization and production of phytoconstituents such as Quinine, Calcium sennosides, Podophyllotoxin, Diosgenin, Solasodine and Tropane Alkaloids.
3. Utilization of aromatic plants and derived products with special reference to Sandalwood oil, Mentha oil, Lemon grass oil, Vetiver oil, Gentium oil and Eucalyptus oil.
4. Marine pharmacognosy novel medicinal agents from marine sources.
5. Introduction, classification and study of different chromatographic methods and their applications in evaluation of herbal drugs.
6. Holistic concept of drug administration in traditional systems of medicine, introduction to ayurvedic preparations like arishtas, asavs, gutikas, tailas, churans, lehyas and bhasmas.

PHARMACOLOGY-I
1. General Pharmacology
   a. Introduction to pharmacology, sources of drugs, dosage forms and routes of administration, mechanism of action, combined effects of drugs, factors modifying drug action, tolerance and dependence, pharmacogenetics.
   b. Absorption, distribution, metabolism and excretion of drugs, principle of basic and clinical pharmacokinetics adverse drug reactions and treatment of poisoning. ADME drug interactions, receptors, bioassay of drugs and biological standardization, discovery and development of new drugs. Introduction to clinical trials, bioavailability and bioequivalence studies.
2. Pharmacology of peripheral nervous system
   a. Neurohumoral transmission (autonomic and somatic).
   b. Parasympathomimetic, parasympatholytic and sympathomimetics.
   c. Adrenergic receptors and neuron blocking agents, ganglionic stimulants and blocking agents.
   d. Neuromuscular blocking agents.
   e. Local anaesthetic agents.
3. Pharmacology of drugs acting on gastrointestinal tract
   a. Antacids, anti-secretory and anti-ulcer drugs (pathophysiology of ulcer).
   b. Laxatives and anti-diarrhoeal drugs.
c. Appetite stimulants and suppressants.
d. Emetics and anti-ematics.
e. Carminatives, demulcents, protectives, adsorbents, astringents, digestants, enzymes and mucolytics.

4. Autacoids:
a. Histamine, bradykinin, 5-HT and their antagonists.
b. Prostaglandins, leukotrienes and platelet activating factors.
c. Pentagastrin, cholecystokinin, angiotensin, bradykinin and substance P

5. Analgesic, antipyretic, anti-inflammatory (vascular and cellular events of acute inflammation, chemical mediators of inflammation, pathogenesis of chronic inflammation), anti-gout and anti rheumatic drugs (pathophysiology of gout and rheumatoid arthritis)

6. Pharmacology of drugs used for respiratory system: Anti-asthmatic drugs (pathophysiology of asthma) including bronchodilators, antitussives, expectorants and respiratory stimulants.

PHARMACEUTICS -VIII (PHARMACEUTICAL TECHNOLOGY-II)
1. Microencapsulation: Types of microcapsules, importance of microencapsulation in pharmacy, microencapsulation by phase separation, co-accervation, multiorifice centrifugal, spray drying, spray congealing, polymerization complex emulsion, air suspension technique, coating pan and other techniques, evaluation of microcapsules.
2. Parenteral products:
a. Preformulation factors, routes of administration, water for injection, pyrogenicity, non-aqueous vehicles, and isotonicity. b. Aseptic techniques: Sources of contamination and methods of prevention, design of aseptic area, laminar flow bench services and maintenance.
c. Formulation details, containers and closures and their selection.
d. Pre-filling treatment, washing of containers and closures, preparation of solution and suspensions, filling and closing of ampoules, vials, infusion fluids, lyophilization and preparation of sterile powders, equipments for large-scale manufacture and evaluation of parenteral products.
3. Design, development, production and evaluation of controlled released formulations.
5. Ophthalmic preparations: Requirements, formulation and methods of preparations, containers, and evaluation.

PHARMACEUTICAL BIOTECHNOLOGY
1. Introduction, historical perspective, genomics, proteonomics and other biotechnology related techniques, scope and future of pharmaceutical biotechnology.
2. Enzyme immobilization: Introduction, factor affecting enzyme kinetics, Technique of immobilization of enzymes, immobilization of plant and bacterial cell, study of enzymes such as hyaluronidase, penicillinase, streptokinase and steptodornase, amylase and protease, therapeutic applications of enzyme immobilization.
3. rDNA technology: Introduction, transformation, conjugation, transduction, protoplast fusion and plasmid mediated gene transfer, gene cloning including enzymes acting on DNA, cloning vectors, insertion of target DNA into vector, transformation and growth of cells, selection of recombinant clones and their applications, techniques of genetic engineering, study of drugs produced by biotechnology such as activase, humulin, humantrone, HB etc.
4. Vaccine technology: Introduction, immunological principles, conventional vaccines, modern vaccine technologies, development of hybridoma for monoclonal antibodies and monoclonal antibody based pharmaceuticals, pharmaceutical considerations of vaccines.
5. Fermentation: Introduction to fermentation, fermenters and types of fermenters, factors affecting design
of fermenter, the fermentation process and its optimization with special reference to ethyl alcohol, riboflavin, cephalosporin and ascorbic acid.

6. Production and downstream processing of biotech products: Introduction, production, downstream processing, issues to consider in production and purification of proteins, formulation of biotech products and its biopharmaceutical considerations, pharmacokinetics and pharmacodynamics of peptide and protein drugs.

7. Plant tissue culture: Introduction, laboratory requirements, cellular totipotency, types of cultures, protoplast fusion and somatic hybridization, transgenic plants and application of transgenic plants, cryopreservation and application of PTC in Pharmacy.

PHARMACEUTICAL CHEMISTRY-VI (MEDICINAL CHEMISTRY-II)
Classification, synthesis of selective drugs, Structure-activity relationship, Pharmacological/Biochemical mechanism of action, Therapeutic uses of following category of agents: (special emphasis should be given to specified drugs)

1. Drugs affecting central nervous system:

2. Drugs affecting Hormonal System:
   a. Thyroid hormones and Antithyroid agents: Biosynthesis of thyroid hormones Propthyiouracil, Methimazole, Carbimazole and I131.
   b. Insulin and Oral Hypoglycaemic agents: Chemistry of Insulin and its preparations (Chlorpropamide, Tolbutamide, Glimepride, Glipizide, Rosiglitazone, Pioglitazone, Metformin, Phenformin, Acarbose, Miglitol, REPAGLINIDE).

4. Chemistry and physiological importance of water & lipid soluble Vitamins.

PHARMACEUTICS -IX (PACKAGING TECHNOLOGY)
1. Packaging of pharmaceutical dosage form: Introduction, Definition and function, Regulatory requirements, Nature of package evaluation, Types of packaging.
2. Packaging of solid oral dosage form: Scope, Packaging, stability and shelf life of containers and closures, Unit dosage packaging.
3. Packaging of semisolids and topical: Scope, regulatory requirements, containers and closures.
4. Glass packaging materials: Containers and closures, Glass as a packaging material, composition and types.

PHARMACOLOGY-II
1. Pathophysiology of CNS diseases and pharmacology of drugs used to treat them
   b. General anesthetics, alcohol and disulfiram.
   c. Hypnotics, sedatives, antianxiety agents, and centrally acting muscle relaxants.
   e. Antiepileptic drugs.
   f. Narcotic analgesics and antagonists.
   g. Drugs used in neurodegenerative diseases: Parkinson’s disease and Alzheimer’s disease
   h. Drug addiction and drug abuse: Alcohol, Nicotine and Cannabis.
   i. CNS stimulants.

2. Pathophysiology of diseases of endocrine system and pharmacology of drugs used for their treatment.
   a. Hypothalamic and pituitary hormones.
   b. Thyroid hormones and anti thyroid drugs.
   c. Insulin, oral hypoglycemic agents and glucagons.
   d. Corticosteroids.
   e. Androgens, anabolic steroids and drugs for erectile dysfunction.
   f. Estrogens, progestins and oral contraceptives.
   g. Oxytocin and drugs acting on the uterus.
   h. Parathormone, calcitonin and vitamin D, ACTH and corticosteroids.

3. Drug acting on Haematopoietic system
   a. Haematinics (pathophysiology of anaemia)
   b. Anticoagulants
   c. Fibrinolytic and antiplatelet drugs
   d. Blood and plasma volume expanders.

PHARMACEUTICS-X (BIOPHARMACEUTICS AND PHARMACOKINETICS)

Biopharmaceutics
1. Introduction: Definition and significance of Biopharmaceutics in formulation development.
2. Gastrointestinal absorption of Drugs: Passage of drugs across biological membranes nature of biological membranes, gastrointestinal absorption mechanism.
3. Factor affecting Drug absorption: Physiological factors, dietary factors, physicochemical factors, pH partition hypothesis, and dosage form factors.

**Pharmacokinetics**
1. Definition and need of pharmacokinetic and clinical pharmacokinetics.
2. Introduction to pharmacokinetic parameters, biological half-life, volume of distribution, clearance, rate constants for elimination.
3. One compartment model: Single dosing-intravenous injection and oral absorption, determination of pharmacokinetic parameters from plasma and urine data, measurements of Cmax, Tmax, and AUC.
4. Bioavailability and Bioequivalence: Definition and detailed protocol, Significance of Bioavailability and Bioequivalence studies. Regulatory requirements.

**PHARMACEUTICAL CHEMISTRY-VII (MEDICINAL CHEMISTRY-III)**
2. Modern Medicinal Chemistry: Introduction to Combinatorial Chemistry, High throughput screening, Green Chemistry and Microbial biotransformation. Classification, synthesis of selective drugs, Structureactivity relationship, Pharmacological/Biochemical mechanism of action, Therapeutic uses of following category of agents: (special emphasis should be given to specified drugs).
5. Chemotherapeutic agents:
   II. Antiparasitic agents: Antiprotozoal and Anthelmentic agents.
   III. Antiamoebic agents: Metronidazole, Tinidazole and Diloxanide Furoate.
IV. Antimalarial drugs: Chloroquine Phosphate, Amodiaquine, Pamaquine, Pentaquine Phosphate, Chloropropuanil Hydrochloride, Cycloguanyl Enbonate, Pyrimethamine and Trimethoprim.
V. Antifungal agents: Fluconazole, Tolnaftate, Clotrimazole, Miconazole, Ketoconazole, Fluconazole, Amphotericin-B, and Griseofulvin.
VI. Antimycobacterial agents: Pyrazinamide, Rifampin, Ethambutol Hydrochloride, Isoniazid and Ethionamide.
VII. Anticancer agents, Immunosuppressants and Immunostimulants: Cyclophosphamide, Chlorambucil, Busulfan, Methotrexate, Azathioprine, Cytoxan, Fluorouracil, Methotrexate, Dactinomycin, Daunorubicin Hydrochloride, Doxorubicin Hydrochloride, Etoposide, Vinblastin Sulphate, Vincristin Sulphate and Cisplatin.

PHARMACOLOGY-III
1. Pathophysiology of microbial diseases (Tuberculosis, leprosy, fungal diseases, urinary tract infections, sexually transmitted diseases) and pharmacology of drugs used for their treatment
2. Pathophysiology of Cardiovascular diseases (Hypertension, angina, congestive heart failure, atherosclerosis, myocardial infarction) and pharmacology of drugs used for their treatment. a. Cardiac glycosides, b. Anti-arrhythmic drugs, c. Antianginal drugs, d. Antihypertensive drugs, e. Antihyperlipidemic drugs
3. Anti-neoplastic drugs (pathophysiology of cancer), immunostimulants and immunosuppressive agents.
4. Drugs acting on urinary system: Diuretics

PHARMACOLOGY-IV
2. Drugs used during infancy, neonates, in the elderly persons and their bio-pharmaceutics.
3. Drugs used during pregnancy and drug induced diseases.
4. The principles, mechanism and clinical evaluation of drug interactions.
5. Common clinical laboratory tests and their interpretation.
7. Therapeutic Drug Monitoring, Concept of Essential Drugs and Rational Drug use.
8. Principles of Toxicology: Definition of poison, general principles of treatment of poisoning with particular reference to barbiturates, opioids, organophosphorous and atropine poisoning, Heavy metals and heavy metal antagonists.

PHARMACEUTICAL INDUSTRIAL MANAGEMENT AND ACCOUNTANCY
1. Concept of Management: Administrative Management (Planning, Organizing, Staffing, Directing and Controlling), Entrepreneurship development, Operative Management (Personnel, Materials, Production, Financial, Marketing, Time/space, Margin/Morale), Principles of Management (Co-ordination, Communication, Motivation, Decisionmaking, Leadership, Innovation, Creativity, Delegation of Authority/Responsibility, Record Keeping), Identification of Key Points to give maximum thrust for development and perfection.
2. Economics: Principles of economics with special reference to the laws of demand and supply, demand schedule, demand curves, labour welfare, general principles of insurance and inland and foreign trade, procedure of exporting and importing goods.
3. Materials Management: A brief exposure or basic principles of materials management major areas, scope, purchase, stores, inventory control, an evaluation of material management.

**PHARMACEUTICAL ANALYSIS- IV (QUALITY ASSURANCE)**
1. Quality assurance: Concept, Scope, quality control, auditm, total quality management.
2. Development of new analytical methods.
3. Validation: Definition, types, validation of manufacturing and analytical equipments, validation of analytical procedures, importance and limitations of validation, organization for validation.
5. Documentation: Protocols, forms and maintenance of records in pharmaceutical industries, preparation of documents for new drug approval and export registration to United States, United Kingdom, Europe and Africa.
7. Requirement of GMP, GLP, ISO 9000, WHO and U.S. F.D.A.
8. In-process quality control tests, IPQC problems in pharmaceutical industries, sources and control of quality variation, total quality management.
9. Sampling plans, sampling and operating characteristics curves, interpretation of analytical data.
10. Regulatory control and regulatory drug analysis.

**DRUG DESIGN**
1 Drug Discovery, Design and Development: Introduction to drug design and development, stages of drug design and development, finding a lead, optimizing target interactions, optimizing access to target.
2 Quantum Mechanics and Molecular Dynamics: Introduction to quantum mechanics, Postulates of quantum mechanics, electronic structure, AB initio, semi-empirical, density functional and molecular orbital theories. Introduction to molecular mechanisms, Vander Waal interaction, electrostatic interaction, force field and energy minimization. Introduction to Molecular Dynamics, Conformational searching, Systematic search and applications.
3 Ligand Based Drug Design: Introduction to QSAR, lead molecule, linear and nonlinear modeled QSAR equations, statistics used in QSAR, physicochemical parameter and molecular descriptors, Hansch approach, Fujita-Ban approach, Hybrid QSAR, Graph Theory, Topological QSAR, 3D-QSAR, MSA, RSA, CoMFA, CoMSIA, Pharmacophore mapping and applications of QSAR in drug discovery, Case study: Tubulin polymerization inhibitors
4 Structure Based Drug Design: Methods to derive 3D structures, X-ray crystallography and NMR spectroscopy, pharmacophores, molecular docking, De novo design, Free energies and salvation, electrostatic and non-electrostatic contribution to free energies, 3D data base searching and virtual screening, molecular similarity and similarity searching, combinatorial libraries – generation and utility and further applications on the design of new molecule, Case study: Thymidylate synthase inhibitors and HIV protease inhibitors.
5 Comparative Protein Modeling: Modeling by Homology-the alignment, construction of frame work, selecting variable regions, side chain placement and refinement, validation of protein models–Ramchandran plot, threading and AB initio modeling, Case study: p38 kinase.
PHARMACEUTICAL SALES AND MARKETING
1. Introduction to Pharmaceutical Marketing Management
2. Marketing Task: Demand States & Marketing task, Scope of Marketing and Different Markets
3. Concept of Marketing: Definition of marketing, Distinction between marketing & Selling, Core
   Marketing Concept, Marketing Place, Marketing Space, Target Market, Segmentation of Market, Needs,
   Wants & Demands, Product offering, value & satisfaction, Relationship net work, Supply chain
   competition, Marketing environment, marketing mix (4 P Components), Other concept's name under
   marketing activities.
4. Marketing Opportunities Market Oriented Strategic Planning: SWOT Analysis, Strategic Formulation
   and Product Planning. Gathering Information and Measuring Demand: MIS, Market Research,
   Behavioural Research, Marketing Research, Forecasting & Demand Measurement. Analyzing Consumer
   Markets & Buyer Behavior: Influencing Buyer Behavior, Buying Decision Process, Motivation of
   Physician towards Brand. Dealing With The Competition - Identifying Competitors, Analyzing
   Competitors, Strategies, Strength & Weakness, Designing Competitive Strategies.
5. Developing Market Strategies & Marketing Mix, Product Strategy Positioning & Differentiating the
   Market Offering (Product): Positioning to Promote Product Life Cycle Marketing Strategies. New Market
   Offering: Which markets to Enter, How to Enter the Market, Product Development, Market Testing.
   Setting the Product Strategy: Product & Product Mix, Product Line Analysis, Brand Decision, Packaging
   & Labeling.
   Value Net-Work & Marketing Channels: Channel Functions, Channel Levels, Channel Management,
   Decisions, Selecting, Training, Motivating & Evaluating Channels Members, Channel Dynamics,
   of Retailing, Types of Wholesaling. Managing Advertising, Sales Promotion & Public Relations:
   Advertising Objective, Choosing the Advertising Message, Measuring Effectiveness of Advertisement,
   Sales Promotion & Purpose, Public Relations. Managing Sales Force: Recruitment & Selecting
   Representative, Training Sales Representative, Supervising, Norms for Customer Calls, Motivating Sales
   Representative, Evaluating Sales Representative.

FOOD SCIENCE TECHNOLOGY
1. Food Chemistry: Food quality characteristics, Composition and nutritive value of common foods,
   structure, properties and metabolic function of food constituents like water, carbohydrates, lipids,
   proteins, enzymes, vitamins, minerals, pigments, colors and flavoring substances; Undesirable
   constituents in food, Changes in food constituents during processing and storage.
2. Food Microbiology: Microbial groupings and identification, Nutrient requirements for bacterial culture,
   Growth and inactivation kinetics, Harmful and beneficial effects of microbes, microbes in food industry,
   Food spoilage, poisoning and intoxication.
3. Food Process Principles: Basic principles and techniques of food preservation and processing.
4. Food Technology: Technological process for industrial manufacture of selected foods of commercial
   importance like Jelly, Pickles, Carbonated beverages, Fruit beverages, Bakery and Confectionary
   products and Dairy products.
5. Food laws and standards: Food additives, Food packaging, Quality control in food industry.

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**PGQP25**

**Entrance Test for the Course(s):** M.Sc. (Industrial Chemistry) [CUGUJ], (Chemical Sciences) [CUGUJ], (Chemistry) [CUHAR] [CUJHD] [CUKER] [CUKNK] [CUPUN] [CURAJ] [CUSBR] [CUTND], (Chemistry (Applied Chemistry)) [CUPUN], (Chemistry (Theoretical and Computational Chemistry)) [CUPUN], (Chemical Sciences (Medicinal Chemistry)) [CUPUN], M.Sc. B.Ed. (Chemistry) [CURAJ], PG Diploma (Chemical Lab Technician) [CUTND]

1. **PART-A** will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. **PART-B** will consist of 75 objective questions (MCQs) from the following syllabus:

   **INORGANIC CHEMISTRY**

   I. **Atomic Structure:**
   Evidence for the electrical nature of matter; discharge tube experiments; Thomson’s atomic model; Rutherford model; Bohr's model of hydrogen atom; probability picture of electron; quantum numbers; Shapes of s, p, d, orbitals; Aufbau and Pauli exclusion principles, Hund’s rule of maximum multiplicity; Electronic configurations of the elements; effective nuclear charge.

   II. **Chemical Bonding:**
   Covalent bond – Valence Bond Theory (VBT) and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence Shell Electron Pair Repulsion Theory (VSEPR Theory) to NH₃, H₂O⁺, SF₄, ClF₅, ICl₂⁻ and H₂O. Molecular Orbital Theory, homonuclear and heteronuclear diatomic molecules (CO and NO), multicenter bonding in electron deficient molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.

   III. **Periodic Properties:**
   Atomic and ionic radii, ionization energy, electron affinity and electronegativity, definition, methods of determination or evaluation, trends in periodic table and applications in predicting and explaining the chemical behaviour.

   IV. **Acids, Bases and Non Aqueous Solvents:**

   V. **s – block elements:**
   Comparative study including diagonal relationship of groups, salient features of Hydrides, solvation and complexation tendencies including their function in biosystems. An introduction to alkyls and aryls.

   VI. **p - block elements (A):**

   VII. **p - block elements (B):**
Comparative study including diagonal relationship of groups 15, 16 and 17. Group 15—phosphazenes, group 16—tetra sulfur tetranitride, group 17—basic properties of halogens, interhalogens and polyhalides.

VIII. Chemistry of Noble Gases:
Chemical properties of Noble Gases, Chemistry of Xenon, structure and bonding in Xenon compounds.

IX. Chemistry of the Elements of the First Transition Series:
Characteristic properties of the d-Block elements. Properties of the elements of the first transition series, their binary compounds, and complexes illustrating relative stability of their oxidation states, coordination number and geometry.

X. Coordination compounds:
Werner’s co-ordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of co-ordination compounds. Isomerism in co-ordination compounds, valence bond theory of transition metal complexes

XI. Oxidation and Reduction:

XII. Chemistry of the Lanthanide Elements:
Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.

XIII. Chemistry of the elements of the second and third transition series:
General characteristics, comparative treatment with their 3d analogues in respect of Ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry.

XIV. Chemistry of Actinides:
General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, similarities between later actinides and later lanthanides.

XV. Ionic Solids:
Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, salvation energy and solubility of ionic solids, polarizing power and polarizability of ions, Fajan’s rule, metallic bond - free electron, valence bond and band theories.

XVI. Metal-Ligand Bonding in Transition Metal Complexes:

XVII. Bio-inorganic Chemistry:
Overview, essential and trace elements in biological processes, Metalloporphyrins with special reference to haemoglobin and myoglobin. The role of Model systems, The alkali and alkaline earth metals, Metalloenzymes, Nitrogen fixation cycle.
XVIII. Inorganic solid state chemistry:

XIX. Organometallic Chemistry:
(A) Definition, nomenclature and classification of organometallic compounds, EAN rule, 18 electron rule. General methods of preparations and properties. Structure and bonding in mononuclear metal carbonyls: Ni(CO)4, Fe(CO)5 and Cr(CO)6
(B) Polynuclear metal carbonyl: preparation and structures of Mn2(CO)10, Fe2(CO)9 and Fe3(CO)12 (Orbital diagram not expected)
(C) Sandwich compounds like Ferrocene: preparation, properties, reactions, structure and bonding.
(D) Preparation and properties of alkyl and aryls of Li, Al, Hg and Ti.

XX. Electronic spectra of Transition Metal Complexes:
Introduction, Types of electronic transitions: The d-d transitions, Charge transfer transitions and Ligand-ligand transitions, Selection rules (Laporte Orbital and Spin), Applications (Ligand field strength, Colour of complexes, cis-trans isomerism and geometry of complexes).

XXI. Industrial fuels and chemicals:
A) Industrial fuels like coal gas, producer gas and water gas.
B) Physico chemical principles involved in the manufacture of HNO3 (Ostwald’s method) and NH3 (Haber’s method).

XXII. Symmetry and Term symbols:
Symmetry elements: Centre of symmetry, Rotation axis, Mirror plane, rotation – reflection axis, Identity (Transdichloroethylene, H2O and BCl3).

XXIII. Magnetic properties of transition metal complexes:
Types of magnetic behaviour, Methods of determining magnetic susceptibility (Gouy’s method), spin only formula, application of magnetic moment data for 3d – metal complexes.

XXIV. Selected topics:
A) Nanochemistry: Introduction to nano particles, their properties and applications.
B) Solid acids: Introduction to zeolites, structure and applications.
C) Superconductors: Discovery, critical temperature, Meissner effect, Types: Conventional and High Temperature superconductors.

XXV. Inorganic Polymers:
Definition, Properties, Glass transition temperature, Classification (Condensation, addition and coordination Polymers). Silicones: Preparation, structure & bonding and applications.

XXVI. Thermodynamic and kinetic aspects of metal complexes:
A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of octahedral complexes. Trans effect with respect to square planar complexes.

PHYSICAL CHEMISTRY

I. Mathematical Concepts:
Logarithmic relations, curve sketching, linear graphs and calculations of slopes differentiation of functions, maxima & minima, partial, differentiation & reciprocity relations. Integration of some useful/relevant functions.

II. Gaseous State:
Postulates of kinetic theory of gases and deviation from ideal behaviour, Van der Waal’s equation of state. Critical phenomena; PV isotherms of real gases, continuity of states, the isotherms of van der Waal’s equation, relationship between critical constants and van der Waal’s constants, the law of corresponding states, reduced equation of state. Molecular Velocities: Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell’s distribution of molecular velocities, collision number, mean free path and collision diameter, liquefaction of gases (based on Joule – Thomson effect).

III. Chemical Kinetics
Rate of reaction, factors influencing the rate of a reaction concentration, temperature, pressure, solvent, light, catalyst Concentration dependence of rates mathematical characteristics of simple chemical reaction. Zero order, first order, second order, pseudo order, half life & mean life. Determination of order of reaction: Differential method Integration method, Method of half life period & Isolation method. Radioactive decay as a first order phenomenon. Theories of Chemical Kinetics. Effect of temperature on the rate of reaction, Arrhenius equation and concept of activation energy. Simple collision theory based on hard sphere model. Transition state theory (equilibrium hypothesis ). Expression for the rate constant based on equilibrium constant & thermodynamic aspects.

IV. Thermodynamics:

V. Solutions, Dilute Solutions and Colligative Properties:

VI. Liquid State and Applications:
Intermolecular forces, structure of liquids (Qualitative description) Structural differences between solids, liquids and gases. Liquid crystal: Difference between liquid crystals, solid and liquid. Classification, structure of nematic and cholesteric phases. Thermography and seven segment cell. Surface between a liquid and vapour. Surface tension by capillary rise method, stalgmometer method. Viscosity of liquids, Poiseuille equation, use of Ostwald’s Viscometer.

VII. Thermodynamics:
Second law of thermodynamics: need for the law, different statements of the law. Carnot cycle and its efficiency, Carnot theorem. Thermodynamic scale of temperature. Concept of entropy: entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical change, Clausius inequality, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases. Third law of thermodynamics: Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions; Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity, their advantages over entropy change. Variation of G and A with P, V & T.

VIII. Chemical Equilibrium:
Equilibrium constant and free energy. Thermodynamic derivation of law of mass action. LeChatelier’s principle. Reaction isotherm and reaction isochore – Clapeyron equaltion and Clausius – Clapeyron equation, applications.

IX. Phase Equilibrium:

X. Electrochemistry:
Electrical transport – conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance measurement of equivalent conductance, variation of equivalent and specific conductance with dilution. Migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald’s dilution law its uses and limitations. Debye–Huckel-Onsager’s equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf method and moving boundary method. Applications of conductivity measurements: determination of degree of dissociation, determination of ka of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

XI. Solid State:
Definition of space lattice, unit cell. Laws of crystallography – (i) law of constancy of interfacial angels (ii) law of rationality of indices (iii) law of symmetry elements in crystals. X-ray diffraction by crystals. Derivation of Bragg equation. Determination of crystal structure of NaCl, KCl and CsCl (Laue’s method and powder method).

XII. Colloidal State:

XIII. Quantum Chemistry:
De Broglie hypothesis, the Heisenberg’s uncertainty principle, sinusoidal wave equation, Hamiltonian operator, Schrödinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in one dimensional box. Schrödinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance, hydrogen like wave function, radial wave functions, angular wave functions.

XIV. Electrochemistry:
(A) Electrolytic and galvanic cells; reversible and irreversible cells, conventional representation of electrochemical cells; types of reversible electrodes; gas – metal ion, metal-metal ion, metal-insoluble salt anion and redox electrodes, electrode reaction; Nernst equation; derivation of cell E.M.F. and single electrode potential, reference electrodes, standard hydrogen electrode; calomel electrodes; standard electrodes potential, sign convention, electrochemical series and its applications. EMF of a cell and its measurements; Concentration cells (both electrodes and electrolytes) with and without transport; liquid junction potential and its measurement; Application of concentration cell; determination of ionic product of water; transport number of ions; solubility and solubility product. Polarization; elimination of polarization; decomposition potential, measurement of decomposition potential; factor affecting decomposition potential over voltage and types of over voltage; measurement of over voltage ; factor affecting over voltage.

XV. Molecular Structure:
Optical activity and molecular structure; polarization (Mosotti-Clausius equation), orientation of dipoles in an electric field, dipole moment, induced dipole moment, measurement of dipole moment; temperature method and refractivity method, dipole moment and structure of molecules.

XVI. Nuclear Chemistry:
Composition of the nucleus. Nuclear binding forces, binding energy, stability, nucleon-nucleon forces and their equality, characteristics and theory of nuclear forces. Nuclear models, the shell model, liquid drop model and its merits. Theory of radioactive disintegration, rate of disintegration half, average life of radio element, units of radioactivity, definition and characteristics of artificial radioactivity. Determination and measurements of radioactivity: Ionisation current measurements; saturation collection; multiplicative ion collection; the Geiger-Muller Counter, characteristics of an ideal Geiger-Muller Counter, proportional counter. methods based on photon collection, Scintillation counter, characteristics of a suitable Scintillator. Nuclear fission, energy released in fission and fission products, neutron emission in fission, nuclear energy, classification of reactors, the breeder reactor, nuclear reactors in India.

XVII. Molecular structure and molecular spectra:
Introduction to electromagnetic radiation; regions of the spectrum; statement of the Born-Oppenheimer approximation; degrees of freedom. Rotational Spectrum: Diatomic molecules, energy level of a rigid rotor (semi-classical principles), selection rules, spectral intensity, distribution using population distribution (Maxwell-Boltzmann distribution); determination of bond length, qualitative description of non-rigid rotor, isotope effect.

XVIII. Photochemistry:
Interaction of radiation with matter, differences between thermal and photochemical processes, laws of photochemistry: Grothus- Drapper law, Stark-Einstein law, Jablonski diagram; depicting various processes occurring in the excited state, quantum yield and its measurements qualitative description of
fluorescence, phosphorescence, non-radiative processes (internal conversion, inter system crossing), photosensitized reactions-energy transfer processes (simple examples).

XIX. Spectroscopy:
Vibrational Spectrum: Infrared spectrum: energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of an- harmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional groups. Raman spectrum: Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules.

ORGANIC CHEMISTRY

I. Structure and Bonding:
Hybridization, C-C bond lengths and bond angles, bond energy, localized and delocalized chemical bonds, Definition and examples of Van der Waals interactions, resonance, hyperconjugation, inductive and field effects, intramolecular and intermolecular hydrogen bonding.

II. Fundamentals of Organic Chemistry:
Curved arrow notation, drawing electron movement with arrows, half and double headed arrows, homolytic and heterolytic bond breaking. Types of reagents – electrophiles and nucleophiles with examples. Types of Organic Reactions: Addition, Elimination, Substitution, Oxidation, Reduction and Rearrangement-one example of each. Energy profile diagrams for exothermic and endothermic reactions, single step and two step reactions. Reactive intermediates – Carbocations, carbanions, free radicals, carbenes, arynes and nitrenes; examples, shape and ways of formation. Assigning formal charges on intermediates and other ionic species. Methods of determination of reaction mechanisms (one example each of product analysis, intermediates, isotope effects, kinetic and stereochemical studies). Theory of acids and bases: Lewis concept; Bronsted and Lowry concept.

III. Alkanes and cycloalkanes:

IV. Alkenes, dienes and alkynes:
V. Stereochemistry of organic compounds:

VI. Arenes and Aromaticity:

VII. Alkyl and aryl halides:
Nomenclature and classes of alkyl halides, general methods of formation, chemical reactions. Mechanism and stereochemistry of nucleophilic substitution reactions of alkyl halides, SN₂ and SN₁ reactions with energy profile diagrams, solvent effect. The addition – elimination (bimolecular displacement) and the elimination – addition (benzyne) mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides vs. allyl, vinyl and aryl halides.

VIII. Electromagnetic Spectrum: Absorption Spectra:

IX. Alcohols:

X. Ethers and Epoxides:
Nomenclature of ethers and methods of preparation by Williamson synthesis, from alcohols by use of diazomethane and by use of H2SO4. Physical properties. Chemical reactions: cleavage with HI. Synthesis of epoxides by reaction of alkenes with peracids and by elimination from vicinal halohydrins. Acid and
base catalyzed ring opening of epoxides, orientation of ring opening, reactions of Grignard and organolithium reagents with epoxides.

XI. Aldehydes and Ketones:
Nomenclature and structure of the carbonyl group. Synthesis of aldehydes by oxidation of alcohols and reduction of acid chlorides, synthesis of ketones by oxidation of alcohols, from nitriles by Grignard reaction and from carboxylic acids. Physical properties. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations, reaction with ammonia and its derivatives, Wittig reaction and Mannich reaction. Halogenation of enolizable ketones. Mechanisms and one application each of the above reactions.

XII. Phenols:
Nomenclature, structure and bonding. Preparation of phenols by alkali fusion of aromatic sulphonic acids, Dow’s process from chlorobenzene and from Cumene through hydroperoxide rearrangement with mechanism. Physical properties and acidic character. Comparative acid strengths of alcohols and phenols, resonance stabilization of the phenoxide ion. Reaction of phenols – Electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement, Gattermann synthesis and Riemer-Tiemann reaction.

XIII. Oxidation and Reduction reactions of carbonyl compounds:
Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction, Meerwein-Pondorf-Verley, Clemmensen, Wolff-Kischner, LiAlH4 and NaBH4 reduction. Mechanisms and one application each of the above reactions

XIV. Carboxylic Acids:

XV. Carboxylic Acids Derivatives

XVI. Organic Compounds of Nitrogen

XVII. Spectroscopy:
Proton Magnetic Resonance (¹H NMR) spectroscopy, theory, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, intensity of peaks, interpretation of PMR spectra of simple organic molecules. ¹³C Magnetic Resonance: Number of signals, splitting of signals – proton coupled and decoupled spectra, off resonance decoupled spectra. ¹³CMR chemical shifts
– identification of hybridization of carbons and nature of functionalization. Mass Spectrometry: Simple idea of instrumentation. Definitions of parent or molecular ion peak and base peak. Isotope effect with respect to alkyl halides. Fragmentation of ketones – α cleavage and McLafferty rearrangement. Problems pertaining to the structure elucidation of simple organic molecules using spectroscopic techniques (UV, IR, PMR, CMR and MS). Types of problems to be specified. UV and IR to be used as supporting data. Types of CMR and Mass spectroscopy problems to be specified.

XVIII. Alkaloids:
Structure elucidation and synthesis of Nicotine, Atropine and Papaverine.

XIX. Stereochemistry of Reactions:
Mechanism and stereochemistry of (i) Addition of halogens and halogen acids to open chain alkenes. Markownikoff’s and anti-Markownikoff’s addition. (ii) SN1, SN2, SNi, substitutions and (iii) E1, E2 and E1,2 elimination reactions.

XX. Heterocyclic Compounds:

XXI. Vitamins and Hormones:

XXII. Amino acids, Peptides, Proteins and Nucleic Acids:

XXIII. Terpenes:

XXIV. Organic synthesis via Enolates:

XXV Fats, Oils and Detergents:
Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides. Hydrogenation of unsaturated oils. Saponification value, iodine value and acid value of oils. Soaps, synthetic detergents, alkyl and aryl sulphonates.

**XXVI. Synthetic Polymers:**

**XXVII. Photochemistry:**
PGQP26

Entrance Test for the Course(s): M.Sc. (Computer Science and Information Technology) [CUHAR], (Computer Science and Information Technology) [CURAJ], [CUKER], [CUTND], [CUSBR], (Computer Science (Big Data Analytics)) [CURAJ], (Computer Application) [CUKNK]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following syllabus:

Basic Mathematics
Set Theory: Venn diagram, set operations, mathematical induction, functions and relations
Algebra and linear algebra: Theory of equations, complex numbers, matrices and Determinants.


Combinatorics: Sum and product rules, permutation, combination, recurrence relations, pigeon-hole principle, principle of inclusion and exclusion Probability and statistics: Mean, median, mode, basic notion of probability, expectation, variance and standard deviation, discrete and continuous probability distributions, binomial, Poisson and normal distributions, conditional probability and Bayes theorem

Digital Logic
Switching theory: Boolean algebra, logic gates, and switching functions, truth tables and switching expressions, minimization of switching functions, Karnaugh map.
Combinational logic circuits: Realization of Boolean functions using gates and multiplexers
Sequential m/c model: Flip-flops, basic design of counters.

Basics of Programming
The student should be familiar with the basic concepts of programming and should be able to write programs involving the following concepts in any one of the following languages: C, C++ or Java. Conditional constructs, iteration (loops), function or method call, recursion, recursive decomposition of a problem. Basic notions of space and time complexity Parameter passing mechanism, scope, binding

Data Structure: Arrays, lists, stacks, queues, binary tree, binary search tree, Basics of searching and sorting, Graph and its representation
Database Management System: ER Diagram, SQL queries

Computer networks: Network Fundamentals and Communication

Operating system: Memory management and Scheduling
**Design analysis and Algorithm**: Divide and Conquer, Greedy Approach, Dynamic Programming, Branch and Bound

**Software Engineering**: Models
Entrance Test for the Course(s): M.A / M.Sc. (Mathematics) [CUJAM], [CUSBR], M.Sc. (Mathematics) [CUKER], [CUHAR], [CUPUN], [CUKNK], [CURAJ], [CUJHD], [CUAPH], M.Sc. B.Ed. (Mathematics) [CURAJ]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

   Algebra: Groups, subgroups, Abelian groups, non-abelian groups, cyclic groups, permutation groups; Normal subgroups, Lagrange's Theorem for finite groups, group homomorphism and quotient groups, Rings, Subrings, Ideal, prime ideal, maximal ideals; Fields, quotient field.


   **Real Analysis:** Sequences and series of real numbers. Convergent and divergent sequences, bounded and monotone sequences, Convergence criteria for sequences of real numbers, Cauchy sequences, absolute and conditional convergence; Tests of convergence for series of positive terms-comparison test, ratio test, root test, Leibnitz test for convergence of alternating series.

   Functions of one variable: limit, continuity, differentiation, Rolle's Theorem, Cauchy’s Taylor's theorem.

   Interior points, limit points, open sets, closed sets, bounded sets, connected sets, compact sets; completeness of R, Power series (of real variable) including Taylor's and Maclaurin's, domain of convergence, term-wise differentiation and integration of power series.

   Functions of two real variable: limit, continuity, partial derivatives, differentiability, maxima and minima. Method of Lagrange multipliers, Homogeneous functions including Euler's theorem.

   **Complex Analysis:** Functions of a complex Variable, Differentiability and analyticity, Cauchy Riemann Equations, Power series as an analytic function, properties of line integrals, Goursat Theorem, Cauchy theorem, consequence of simply connectivity, index of a closed curves. Cauchy’s integral formula, Morera’s theorem, Liouville’s theorem, Fundamental theorem of Algebra, Harmonic functions.

   Integral Calculus: Integration as the inverse process of differentiation, definite integrals and their properties, Fundamental theorem of integral calculus. Double and triple integrals, change of
order of integration. Calculating surface areas and volumes using double integrals and applications. Calculating volumes using triple integrals and applications.

**Differential Equations**: Ordinary differential equations of the first order of the form \( y' = f(x,y) \). Bernoulli’s equation, exact differential equations, integrating factor, orthogonal trajectories, Homogeneous differential equations-separable solutions, Linear differential equations of second and higher order with constant coefficients, method of variation of parameters. Cauchy-Euler equation.

**Vector Calculus**: Scalar and vector fields, gradient, divergence, curl and Laplacian. Scalar line integrals and vector line integrals, scalar surface integrals and vector surface integrals, Green's, Stokes and Gauss theorems and their applications.

**Linear Programming**: Convex sets, extreme points, convex hull, hyper plane & polyhedral Sets, convex function and concave functions, Concept of basis, basic feasible solutions, Formulation of Linear Programming Problem (LPP), Graphical Method of LPP, Simplex Method.

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Entrance Test for the Course(s): M.Sc. (Physics) [CUJHD], [CUKER], [CUPUN], [CUKNK], [CURAJ], [CUJHD], M.Sc. B.Ed. (Physics) [CURAJ], (Physics and Astrophysics) [CUHAR], (Computational Physics) [CUPUN]

1. PART A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following syllabus:


Mechanics and General Properties of Matter: Newton’s laws of motion and applications, Velocity and acceleration in Cartesian, polar and cylindrical coordinate systems, uniformly rotating frame, centrifugal and Coriolis forces, Motion under a central force, Kepler’s laws, Gravitational Law and field, Conservative and non-conservative forces. System of particles, Center of mass, equation of motion of the CM, conservation of linear and angular momentum, con-servation of energy, variable mass systems. Elastic and inelastic collisions. Rigid body motion, fixed axis rotations, rotation and translation, moments of Inertia and products of Inertia, parallel and perpendicular axes theorem. Principal moments and axes. Kinematics of moving fluids, equation of continuity, Euler’s equation, Bernoulli’s theorem.


Solid State Physics, Devices and Electronics: Crystal structure, Bravais lattices and basis. Miller indices. X-ray diffraction and Bragg's law Intrinsic and extrinsic semiconductors, variation of resistivity with temperature. Fermi level. p-n junction diode, I-V characteristics, Zener diode and its applications, BJT: characteristics in CB, CE, CC modes. Single stage amplifier, two stage R-C coupled amplifiers. Simple Oscillators: Barkhausen condition, sinusoidal oscillators. OPAMP and applications: Inverting and non-inverting amplifier. Boolean algebra: Binary number systems; conversion from one system to another system; binary addition and subtraction. Logic Gates AND, OR, NOT, NAND, NOR exclusive OR; Truth tables; combination of gates; de Morgan’s theorem.
**Entrance Test for the Course(s):** M.Sc. (Statistics) [CUHAR], [CUPUN], [CUSBR] [CURAJ], (Statistics and Applied Mathematics) [CUTND]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following syllabus:

   Sequences and Series: Convergence of sequences of real numbers, Comparison, root and ratio tests for convergence of series of real numbers.

   Differential Calculus: Limits, continuity and differentiability of functions of one and two variables. Rolle's theorem, mean value theorems, Taylor's theorem, indeterminate forms, maxima and minima of functions of one and two variables.

   Integral Calculus: Fundamental theorems of integral calculus. Double and triple integrals, applications of definite integrals, arc lengths, areas and volumes.


   Differential Equations: Ordinary differential equations of the first order of the form \( y' = f(x,y) \). Linear differential equations of the second order with constant coefficients.

   Statistics Probability: Axiomatic definition of probability and properties, conditional probability, multiplication rule. Theorem of total probability. Bayes’ theorem and independence of events.


   Standard Distributions: Binomial, negative binomial, geometric, Poisson, hypergeometric, uniform, exponential, gamma, beta and normal distributions. Poisson and normal approximations of a binomial distribution.


   Sampling distributions: Chi-square, t and F distributions, and their properties. Limit Theorems: Weak law of large numbers. Central limit theorem (i.i.d. with finite variance case only).

Testing of Hypotheses: Basic concepts, applications of Neyman-Pearson Lemma for testing simple and composite hypotheses. Likelihood ratio tests for parameters of univariate normal distribution.
Entrance Test for the Course(s): M.Sc. (Material Sciences & Tech.) [CUJAM]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following syllabus:

**Mechanics:** Unit vectors, displacement, area element, volume element, velocity and acceleration in Cartesian, Spherical polar and cylindrical coordinate system. Inertial and non-inertial frames of references, uniformly rotating frame; Coriolis force and centrifugal force. Inverse square law of force: Concept of central and non-central forces. Kepler’s laws and Satellite motion.

**Oscillation:** Differential equation and its solution, Compound , torsional pendulum, Oscillation of two masses connected by spring, Driven harmonic oscillator, Solution of differential equation, power absorption and power dissipation, Sharpness of resonance, Quality factor, Electrical resonance.

**Relativity:** Galilean transformations and conservation laws: conservation of momentum and energy, Search for ether and Michelson-Morley experiment, Lorentz transformations, Length contraction, Time dilation, velocity theorem, mass energy equivalence, Doppler effect.

**Vector Calculus:** Basic idea of vector algebra, Scalar and vector fields, Gradient of a scalar field and its physical interpretation, Line, surface and volume integrals, Divergence of a vector field and its physical significance, Gauss’s divergence theorem, Stokes’ theorem.

**Electrostatics:** Gauss’s law in integral and differential forms, Line integral of electrostatic field, Poisson’s and Laplace’s equations, Dielectrics, Polar and non-polar molecules, Atomic polarizability, Electric susceptibility, Gauss’s law in a dielectric medium (differential and integral forms).

**Electric current and Magnetostatics:** Current and current density, Equation of continuity, Electrical conductivity, Microscopic form of Ohm’s law, Biot-Savart’s law, Ampere’s circuit law (integral & differential forms), Displacement current, Magnetic scalar and vector potentials, Divergence of vector potential, Current loop as a magnetic dipole, magnetic dipole moment and angular momentum.

**Time varying fields:** Self-inductance of a solenoid, Mutual inductance of two solenoids, Self-inductance of a solenoid, Mutual inductance of two solenoids, Selfinductance and mutual inductance of current loops, Reciprocity theorem of mutual inductance, Relation between self and mutual inductance, coefficient of coupling, Maxwell’s equations, Poynting theorem.

**Electromagnetic waves:** Electromagnetic waves in vacuum, electromagnetic waves in dielectric medium, Electromagnetic waves in conductor, modified wave equations, skin depth and characteristic impedance.
**Heat and Thermodynamics:** Conduction, convection and radiation, laws of thermodynamics. Waves: Velocity of transverse waves in a string, velocity of longitudinal waves in a fluid, phase and group velocity, Stationary/standing waves, eigen functions, eigen frequencies.

**Optics:** Young’s double slit experiment, theory of interference fringes, Fresenel’s Biprism, Newton’s rings, Michelson’s interferometer and its applications. Fresnel’s diffraction, Fresnel’s half-period zones, rectilinear propagation of light, zone plate, diffraction at a straight edge, Fraunhofer diffraction, diffraction grating, width of principal maximum, dispersive & resolving power of grating. Polarization by reflection, Brewster’s law, quarter wave plate & half wave plate.

**Statistical Mechanics:** Macro and micro states, Boltzmann’s distribution law, Maxwell’s distribution of speeds and velocities, mean, r.m.s. and most probable speeds, Bose-Einstein (B-E) statistics and distribution law, Fermi-Dirac (F-D) statistics and its distribution law.

**Quantum Mechanics:** Compton Effect, Wave-Particle Duality, Davisson and Germer Experiment, Wave Packet, Phase and Group velocity, Uncertainty Principle, Tunneling effect, Harmonic Oscillator.

**Atomic Physics:** Larmor’s Precession, Bohr’s Corresponding Principle, Stern Gerlach Experiment, Vector Atom Model (ls, jj coupling), Normal and Anomalous Zeeman Effect.

**Solid state physics:** Lattices and bases, unit cell and Winger-Seitz cell, symmetry operations, Bravais lattices in two and three dimensions, Miller indices, Reciprocal lattice and its application to simple cubic, bcc and fcc. Laue’s theory of X-ray diffraction, Bragg’s law, Experimental methods in X-ray diffractions. Einstein’s theory and Debye’s model of specific heat of solids. Superconductivity, Meissner effect, type I & II superconductors, BCS theory, Schottkey and Frankel defects. Law of crystallography, X-ray diffraction by crystal, Bragg’s equation. Determination of crystal structure of ionic solids.

**Quantum Optics:** Raman effect – classical and quantum mechanical explanation, properties of spectral lines, Luminescence, Optical fibre and its types, Critical angle of propagation, Acceptance angles, Numerical aperture, Pulse dispersion, Attenuation and its various mechanism, Attenuation of light in an optical medium, Population inversion, pumping, Principal pumping schemes (three and four levels), Types of lasers (Ruby, He-Ne and semiconductor).

**Electronics:** Kirchoff’s law, voltage and current sources, source transformations, maximum power, series RL, RC, LCR circuit, resonance condition, impedance variation, PN junction diode as a half wave and full wave rectifier, ripple factor and efficiency of HWR and FWR, Zener diode and its characteristics, zener diode as a voltage regulator, characteristics of unijunction diode, tunnel diode and light emitting diode, working and characteristics of UJT, SCR, JFET. Characteristics of a transistor in common base and common emitter transistor, operational amplifier and applications, logic gates. Atomic Structure, Chemical Bonding, s and p Block Elements: Idea of de-Broglie matter wave, quantum numbers, effective nuclear charge, Heisenberg uncertainty principle, periodic properties. Molecular orbital theory, dipole moment &
electronegativity difference, types of hybridization. Diagonal relationship, salient features of hydrides, salvation and complexation tendencies in bio-systems, chemistry of fullerenes, carbide, fluorocarbons and inter-halogen compounds.

**Acid and Bases**: HSAB concept, acid base strength and hardness & softness, symbiosis, non-aqueous solvent; their physical and chemical properties.

**Oxidation and Reduction**: Use of redox potential data-analysis of redox cycle; redox stability in water, structure and properties of silicon and phosphazene.

**Gaseous State**: Gas laws, relationship between critical constants and van der Waal’s constant, law of corresponding states.

**Structure and bonding**: Types of hybridization in carbon compounds, bond length, bond angle and bond energy.

**Nomenclature of organic compounds**: D&L and R&S and E&Z system of nomenclature, mechanism of nucleophilic additions to carbonyl group with particular emphasis on Benzoin aldol, perkin, wittig reaction.

**Chemistry of transition elements**: General characteristics of 3-D elements, Werner co-ordination theory, effective atomic no. concept, nomenclature of co-ordination compounds. Electronic configuration and characteristics of lanthanides and actinides, lanthanide contraction and application.

**Magnetic properties of complexes**: Magnetic susceptibility, LS-coupling, application of magnetic moment, data for structure analysis of complexes.

**Black body radiations**: Stefan`s law, Boltzman law, wein`s displacement law.

**Spectroscopy**: IR and Raman spectroscopy, vibrational spectroscopy, NMR spectroscopy.

**Carbohydrates**: Synthesis and properties of monosaccharide and their inter conversions, osazone formation.

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Entrance Test for the Course(s): M.Sc. (Food Science and Technology) [CUPUN]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following Syllabus:

**DSC- FT- 1A: FUNDAMENTALS OF FOOD SCIENCE AND TECHNOLOGY**

**PART I**

**Unit 1 Introduction to Food Science and Technology**
- Definition, scope and current trends in food science and technology

**Unit II Food Groups, Nutrients and Balanced Diet**
- Definition and meaning of food, nutrition, nutrient, health, concept and characteristics of a balanced diet.
- Introduction to basic food groups and nutrients, food pyramid, macro and micronutrients.
- Effect of processing on nutrients.

**Unit III Browning reactions in foods**
- Classification (enzymatic, non-enzymatic and metallic browning), causes and prevention of browning

**Unit IV Cereals and Pulses**
- Composition and nutritive value, types of cereals, processing of cereals and pulses (gelatinization of starch and the factors affecting it, germination and fermentation), toxic constituents in pulses, milling of pulses.

**Unit V Fruits and vegetables**
- Classification of fruits and vegetables, composition and nutritive value; effect of processing on pigments.

**Unit VI Chocolate and cocoa products** 10 Cocoa bean processing, preparation of chocolate liquor, cocoa butter and chocolate
DSC – FT- 1B : FUNDAMENTALS OF FOOD SCIENCE AND TECHNOLOGY –
PART II

THEORY

Unit I Milk and milk products
  • Composition and nutritive value
  • Introduction to liquid milk technology (clarification, pasteurization, homogenization, fortification, sterilization)
  • Types of milk
  • Effect of processing on milk,
  • Introduction to milk products.

Unit II Eggs
  • Composition and nutritive value
  • Structure of an egg
  • Egg quality and deterioration
  • Green ring formation in boiled egg, preservation of eggs
  • Egg foams – stages of preparation and factors affecting them
  • Effect of heat on egg proteins; functions of eggs in cookery.

Unit III Meat, Fish and Poultry
  • Composition and nutritive value
  • Selection/purchasing criteria for meat, fish and poultry
  • Tenderization of meat.

Unit IV Sugar
  • Composition and nutritive value
  • Properties of sugars
  • Manufacturing/refining of sucrose
  • Sugar cookery – crystalline and non-crystalline candies, sugar based products.

Unit V Fats and oils
  • Composition and nutritive value
  • Types of fats/oils and their functions
  • Rancidity in fat and its prevention
  • Changes in fat during heating
  • Care of fat used for frying, emulsions.

Unit VI Introduction to food hygiene and food adulteration
  • Food hygiene, factors affecting food safety, personal hygiene.
  • Adulteration, adulterants and their effects on health.
DSC – FT- 1C: BASIC BAKING TECHNOLOGY

Unit I Baking Industry
- Baking industry and its scope in the Indian economy.
- History of Bakery - present trends, prospects
- Nutrition facts of bakery products.

Unit II Wheat Grain Technology
- Wheat grain– its structure
- Milling of wheat; types of refined wheat flour; composition of refined wheat flour (gluten, amylose/amylopectin, enzyme activity, moisture) and its storage

Unit III Cake Technology
- Preparation of cakes - types of cakes; ingredients used; methods of batter preparation; steps in cake making; balancing of cake formula; evaluation of the baked cake; operational faults in cake processing and the remedial measures. Labeling and Packaging. Costing
- Cake decoration- different methods of cake decoration

Unit IV Pastry Technology
- Preparation of pastry - types of pastries (short crust, puff/flaky and choux pastry); ingredients; processing and evaluation. faults and remedies.
DSC- FT- 1D: INTRODUCTION TO FOOD SAFETY AND PRESERVATION

Unit I: Purpose and Scope of Preservation
- Objectives of preservation and processing
- Scope of preservation industry in India.

Unit II: Post-harvest Changes and Spoilage
- Physical, chemical and microbiological changes in fruits and vegetables
- Factors affecting growth of microorganisms and the control measures

Unit III: Food Safety
- Key terms, factors affecting food safety, recent 20 concerns
- Food laws, standards and regulations
- Food additives and contaminants
- Hygiene and sanitation
- HACCP

Unit IV: Principles and Methods of Preservation
- Asepsis
- Use of low temperature,
- Use of high temperature
- Removal of moisture
- Removal of air,
- Use of chemical preservatives
- Fermentation
- Irradiation
- Gas preservation
- Newer methods

Unit V: Fruit and Vegetable Processing – Sauces and Beverages
- Chutney and sauces- definition, method of preservation, steps in preparation of chutney and sauces.
- Fruit beverages- definition and classification, method of preservation (with special emphasis on pasteurization, use of chemical preservatives, sugar), role of various ingredients.
DISCIPLINE SPECIFIC ELECTIVE (DSE)
DSE- FT 1: ADVANCED BAKING TECHNOLOGY

Unit I: Bread Technology
• Preparation of bread - ingredients used; methods of dough preparation; steps in bread processing; evaluation of the baked bread; staling of bread; diseases of bread.

Unit II: Biscuit and Cookies Technology
• Preparation of biscuits and cookies – types; ingredients; processing and evaluation.
• Crackers

Unit III: Food Packaging
• Packaging – it’s importance, essential features of an ideal package; various food packaging materials and their characteristics
• recent trends in the field of packaging (active packaging, intelligent packaging, RFID)
• label regulations and designing for packaged foods, nutritional labelling

Unit IV: Marketing and Cost Control
• Marketing - definition, scope, understanding the 4Ps – (Product, Price, Place, Promotion), marketing techniques, marketing and distribution of processed products.
• Cost control – food cost, labour cost and other costs; costing of processed products.
DSE-FT 2: ADVANCED FRUIT AND VEGETABLE PRESERVATION TECHNOLOGY

Unit I: Dehydration and Concentration
- Dehydration- definition and objectives, method of preservation, normal drying curve, water activity, factors affecting rate of drying, sun drying, types of dehydrators (air convection, drum, freeze and vacuum driers) steps in dehydration of fruits and vegetable
- Concentration- definition and objectives, techniques

Unit II: Refrigeration and Freezing
- Definition and objectives, difference between freezing and refrigeration, systems of refrigeration, method of preservation, steps in freezing fruits and vegetables, cryogenic freezing of fruits and vegetable, evaluation.

Unit III: Canning
- Definition and objectives, selection of fruits and vegetables, method of preservation, steps of canning fruits and vegetables (with special emphasis on blanching, exhausting and heat processing), spoilage of canned foods

Unit IV: Introduction to New Food Product Development
- Need and importance for developing a new product, types of new products, challenges, failure of new product

Unit V: Fruit and Vegetable Processing – Pectin Products Preserves and Pickles
- Jam, Jelly and Marmalade- definition, role of pectin and theory of gel formation, method of preservation, steps of preparation, evaluation.
- Preserves- definition, method of preservation, steps of preparation, evaluation, candied, crystallized and glazed fruits.
- Pickles- definition, classification, method of preservation, steps of preparation of vinegar pickles, evaluation.
DSE-FT 3: FOOD SAFETY, HYGIENE AND QUALITY TESTING

Unit I Food Laws and Regulations
- Introduction to food acts laws and standards
- National food safety and standard act
- International standards, regulatory agencies
- Consumer protection act

Unit II Food Quality Management
- Characteristics of quality
- Quality Control,
- Quality Assurance
- Total Quality Management
- Quality Management System
- Good Manufacturing Practices
- Hazard Analysis Critical Control Point System (HACCP)

Unit III Introduction to Food Safety and Hygiene
- Food hygiene
- Factors affecting food safety
- Food spoilage
- Food handling
- Special requirements for high-risk foods,
- Safe food cooking temperature and storage techniques.

Unit IV Hygiene and Sanitation in Food Service Institutions
- Cleaning and disinfection
- Personal hygiene
- Pest control
- Waste disposal

Unit VI Sensory Methods of Food Quality Testing
- Sensation of taste, smell, appearance and flavor, sensory evaluation techniques

Unit VII Objective Methods of Food Quality Testing
- Physical test methods (moisture, acidity, water activity,
texture, viscosity, colour)
- Simple methods of chemical analysis (protein, fat, water, ash)
- Microbiological sampling and testing.
PGQP32

Entrance Test for the Course(s): M.Sc. (Environmental Science & Tech.) [CUPUN], (Environmental Studies) [CUHAR], (Environmental Science) [CURAJ], [CUKER], [CUJAM], [CUJHD], [CUGUJ], [CUSBR].

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following Syllabus:


Life Sciences:
Origin of life: Theories of evolution, genetic drift, speciation, cell organelles, cell division, modes of reproduction, principles of inheritance, epistasis, mutations, chromosomal aberrations, extra- chromosomal inheritance.
Genetic Material: DNA structure and replication, transcription and translation, chromosome structure, protein structure, mutability and repair of DNA, reverse genetics.

Photosynthesis, Plant growth hormones, Dormancy and seed germination, Respiration
Plant and Animal systematics: Bryophytes, Tracheophytes, Gymnosperms, Angiosperms. Membrane structure and Ion transport, ATPase - structure and function, Photosynthesis, Photoperiodism, Vernalization, RUBISCO.
Animal systematics, physiology and diseases: Cnidaria, Echinodermata, Chordata, Protostomia; Anatomy and physiology of humans; major classes of bacterial and viral pathogens, Apoptosis and cancer, inherited diseases, animal cell culture


Microbiology and Biotechnology: Principles of Microbiology, Microbiology of Air, Water, Soil, Sewage, Recombinant DNA technology, principles of gene cloning, transposition, applications of biotechnology in medicine, industry, agriculture and environment.
Natural resources and Management: Natural Resources- Forest, Water, Minerals, Marine, Energy (Renewable and Nonrenewable) - Sources, Threats, Conservation and Management,

Global Environmental issues: ozone depletion and global warming, Acid rain and Smog, Sustainable Development.

Environmental Pollution: Air, Water, Soil, Noise Pollution- Sources, Causes, Effects, Consequences

Waste Management: Solid waste - disposal, Management; Waste to energy conversion.

Instrumentation: Principles and applications of microscopy, spectrophotometry, centrifugation, radioisotope techniques, electrophoresis and chromatographic separation techniques, Blotting and hybridization techniques.
PGQP33

Entrance Test for the Course(s): M.Sc. (Horticulture) [CUTND]

1. **PART-A** will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. **PART-B** will consist of **75 objective questions** (MCQs) from the following Syllabus:


**Ecology:** Physical environment; biotic environment; biotic and abiotic interactions. Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement. Characteristics of a population; population growth curves; population regulation; concept of metapopulation – demes and dispersal, interdemic extinctions, age structured populations. Types of interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis. Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones. Types; mechanisms; changes involved in succession; concept of climax. Structure and function; energy flow and mineral cycling; primary production and decomposition; structure and function of some Indian ecosystems: terrestrial and aquatic. Major terrestrial biomes; theory of island biogeography; biogeographical zones of India.

**Plant Biology:** Photosynthesis: Light harvesting complexes; mechanisms of electron transport; photoprotective mechanisms; CO2 fixation-C3, C4 and CAM pathways. Citric acid cycle; plant mitochondrial electron transport and ATP synthesis; alternate oxidase; photorespiratory pathway. Nitrate and ammonium assimilation; amino acid biosynthesis. Plant hormones: Biosynthesis, storage, breakdown and transport; physiological effects and mechanisms of action. Structure, function and mechanisms of action of phytochromes, cryptochromes and phototropins; stomatal movement; photoperiodism and biological clocks. Solute transport and photoassimilate translocation: Uptake, transport and translocation of water, ions, solutes and macromolecules from soil, through cells, across membranes, through xylem and phloem; transpiration; mechanisms of loading and unloading of photoassimilates. Secondary metabolites - Biosynthesis of terpenes, phenols and nitrogenous compounds and their roles. Responses of plants to biotic and abiotic stresses; mechanisms of resistance to biotic stress and tolerance to abiotic stress. Plant tissue culture and applications, molecular marker technology, transgenic technology – GMOs, transgenic plants for biotic and abiotic stress resistance and quality improvement,
molecular pharming – production of vaccines, therapeutic proteins, industrial enzymes and bioplastics.

**Microscopic techniques**: Visualization of cells and subcellular components by light microscopy, resolving powers of different microscopes, microscopy of living cells, scanning and transmission microscopes, different fixation and staining techniques for EM, freeze-etch and freeze-fracture methods for EM, image processing methods in microscopy.

**Methods in Field biology**: Methods of estimating population density of animals and plants, ranging patterns through direct, indirect and remote observations, sampling methods in the study of behavior, habitat characterization-ground and remote sensing methods.


**Landscaping and Gardening**: Importance and scope of gardening, gardens in india – concepts of landscape gardening – styles and types of gardens – Hindu, Moghul, English, Italian, Persian and Japanese gardens, ornamental landscaping in environmental protection.

**Food Technology**: Food processing industries/institutions/food scientists of importance in India, causes of food spoilage, methods of food preservation, post-harvest and storage of fresh fruits and vegetables, preparations of fruits and vegetables for processing, technology of foods of animal origin.

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1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following Syllabus:


**Computer Science:** Fundamentals of Computer, computer architecture, operating systems, Database Management System, Foundation of programming.

**Earth & Environment:** Earth Interior, Distribution of oceans and continents, composition and structure of atmosphere, world climate and climate change, physical environment, Environmental Pollution and its abatement, Environmental Awareness.
PGQP35

Entrance Test for the Course(s): M.Sc. (Epidemiology and Public Health) [CUTND], M.P.H. (Master of Public Health) [CUKER]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following syllabus:

   I. Basic knowledge of medicine and Public Health
   II. General Biochemistry and Biotechnology
   III. Communicable and Non Communicable diseases and their management
   IV. Basic Immunology
   V. Biostatistics
PGQP36

Entrance Test for the Course(s): M.Sc. (Yoga Therapy) [CURAJ], [CUKER], PG Diploma (Yoga) [CUKER], M.Sc. (Yoga) [CUHAR], M.A. (Yoga) [CUJAM], Diploma (Yoga) [CUJAM], [CUSBR]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following Syllabus:

**Foundations of Yoga**
Yogic science origin, History and development of Yoga, Etymology and definitions, Misconceptions, Aim and objectives of yoga, True nature and principles of Yoga

**English and Communication**
Reading Comprehension, Verbal Reasoning, Analogies, Antonyms, Synonyms, Verb Patterns, Sentence Correction, and Sentence Completion, Odd Man Out, Error Editing and Deduction, Spell Check.

**General Knowledge and Basic Science**
General Knowledge, Capital Cities, Currency, Global Time Zone, Current Affairs, Introduction to cell, tissue, organs and systems, Basic concepts and components of Food and Nutrition

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Entrance Test for the Course(s): M.Com. (Commerce) [CURAJ], [CUKNK], [CUHAR], [CUPUN], [CUSBR], [CUTND], [CUKER], [CUJHD]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following Syllabus:

Micro Economics
4. Pricing of Factors of Production, Concept of Marginal Productivity, Theories of Rent, Wages, Theories of Interest and Profit.

Currency and Banking
1. Functions significance of money, various forms of money, Causes, remedies and effects of Inflation, Deflation and Reflation Indian Money Market, Principles Methods of Note issues, Monetary Standard – Gold Standard, Bi-metallise and Managed Currency Standard.
2. Meaning and significance of credit. Factors influencing the Volume of credit in Country, Credit Creations of Bank, Credit Control by RBI.
3. Functions of Commercial Bank, Types of Banks, Unit and Branch Banking System, concept of Mix Banking, Central Bank and its functions, Reserve Bank of India, State Bank of India, Regional Rural Banks, Progress of Nationalized Banks in India.

Essential of Management
2. Planning: Objective, Nature and process of planning, SWOT Analysis, formulation of plans, Decision making process. Organising: Objectives, nature and process of organizing formal and informal organization, authority and responsibility, delegation and
empowerment, centralisation and decentralisation, concept of departmentation, Organisation Chart, Line, Staff and functional relationships.


**Office Management**

**Accounting**
2. Absorption, Amalgamation and reconstruction of companies, Liquidation of companies and preparation of a Liquidator’s Final Statement of Account.
3. Hire purchase and instalment accounts, Royalties accounts, insolvency accounts.
4. Branch account: Voyage accounts, Accounts of empties and packages; Insurance Claim for loss of Stock and loss of profit.

**Business Organisation**

**Statistical Methods**
2. Methods of statistical Enquiry – Types and characteristics of Units. Methods of collection of data; Questionnaire and schedule; approximations and accuracy, errors and their effects.
3. Classification and Tabulation – Objects, general rules for the construction of tables; statistical series.
4. Measure of Central Tendency – Mean Mode, Median, quartile Harmonic and geometric mean.
5. Measurement of Dispersion and skewness – Range, quartile deviation, mean deviation, standard deviation and their coefficients; Measures of skewness.
7. Regression Analysis – Linear regression, regression lines, regression equations.
8. Interpolation – Assumptions, Newton’s advancing differences, Lagranges’ formula; parabolic curve method; binominal expansion method.

**Public Finance**
1. Public Finance – Definition and Scope; Public and Private finance.
3. Principle of maximum social advantage.
6. Analysis of trends in Central Government’s Revenue, Expenditure and debt. Financing of five year plans, Deficit financing in India.
7. State and local finance, Heads of revenue and items of expenditure and related issues.

**Business Law**
Main Principles of Indian law relating to:
1. Contract

Cost Accounting
2. Single Output or Unit Costing, Contract and Job Costing, Calculation of Tender Quotation, Estimated Price, Process and Operating Costing

Company law and Secretarial Practice
2. Steps before issue of prospects, Definition and contents of prospectus, Liability for untrue statements. Shares: Definition, share Vs stock, classes of shares, voting rights, issue of shares at per, premium and discount, ESOP, Bonus, Rights, Buyback, Public shares at par, premium and discount, ESOP, Bonus, Rights, Buyback, Public issue, Calls, Forfeiture, Lean and Surrender, Transfer and transmission, statutory restriction on transfer, Borrowing power, mortgages and changes, Debentures.
3. Secretarial Practice: Duties and responsibilities of Company Secretary, secretarial duties relating to issue and allotment of shares, Calls, forfeiture Lien and transfer of shares. Majority powers and minority rights, revelation of oppression and management. Specimen of certificate of incorporation. Certificate of commencement of Business, Share certificates and share warrants, Dematerialization of shares.
4. Meeting and proceedings: Provisions relating to the company and Board meetings, Secretarial duties relating to meetings, Notice, Agenda, Proxy, Motion, Resolution, Minutes and Reports.

Selling and Advertising
1. Selling: Concept, Nature and Role in Marketing. Personal Selling: Evolving face of Personal Selling, Nature and importance of Personal Selling, Characteristics of a successful salesperson, Sales as a career option, Sales training, Consumer psychology and buying motives, Selling of consumer and Industrial Products (goods and services)
2. Selling process: Prospecting, Pre-approach, Approach, Sales presentation and demonstration, Handling objections, Closing the sale, After sale service. Effective selling techniques, role of relationship marketing in personal selling, tools of selling, Motivating and Remunerating Salespersons.
3. Advertising: Concept, role, functions, scope and types, Economic, Social, Legal and Ethical aspects of Advertising. Advertising Appeals: Meaning, types and methods, Advertising as a persuasive communication process. Advertising Design: Characteristics and basic elements of Advertising copy. Creation, Production and Planning of


**Business Mathematics**

1. **Calculus**: (Problems and theorems involving trigonometrically ratios are not to be done)
   - Differentiation: Partial derivatives up to second order; Total differentials. Maxima and minima cases of one variable involving second or higher order; Cases of two variables involving not more than one constraint, Integration as anti-derivative process; Standard forms; Methods of integration –by substitution, by parts, and by use of partial functions; Definite integration; Finding areas in simple cases.
2. **Matrices and Determinants**: Definition of a matrix, Types of matrices; Algebra of matrices; Properties of determinants; Calculation of values of determinants up to Third order, Adjoint a matrix; elementary row or column operations; Finding inverse of a matrix through adjoint and elementary row and column operations; Solution of a system of linear equations having unique solution and involving not more than three variables.
3. **Linear Programming – formulation of LPP**: Graphical method of solution; Problems relating to two variables including the case of mixed constraints; Simplex Method – solution of problems up to three variables, Duality, Transportation Problem.
4. **Compound interest and annuities certain, different types of interest rates; concept of present value and amount of a sum; equation of payments, types of annuities; present value and amount of an annuity, including the case of continuous compounding; analysis of annuity; valuation of simple loans and debentures; problems relating to sinking funds.

**Insurance Law and Accounts**

1. **Introduction to Insurance**: Purpose and need of insurance, Insurance as a social security tool; Insurance and economic development, Fundamentals/ Principles of Insurance. Contract of Insurance.
2. **Life Insurance – Principles and practice of life assurance**: Life assurance contract, their nature and characteristics, Parties to the contract and their rights and duties. Conditions and terms of policy. Nominations and Assignment Practice in connection with collection of premium, revivals, loans, surrenders, claims, bonuses and annuity payments, Mortality Table.
3. **Fire Insurance - The basic principles of Fire Insurance contracts**: Fire Policy, conditions, Assignment of Policy, Claims. **Marine Insurance – General Principles – Insurable interest and value disclosure**: Marine Policy and their conditions, Premium double insurance: assignment of policy warrants the voyage, Loss and abandonment: partial losses and particular charges; salvage; total losses and measures of indemnity, Subrogation.
4. **Insurance Intermediaries – Agents and Procedure for Becoming and Agent**: Pre requisite for obtaining a license: Duration of license; Cancellation of license, Revocation of
suspension/ termination of agent appointment; Code of conduct; Unfair practices, Insurance Accounts – Life Insurance and General Insurance Company.

Income Tax Law and Accounts
1. Basic Concepts : Income, agricultural income, casual income, assessment year previous year, gross total income, total income person. Tax evasion, avoidance and tax planning. Basic of Charge; Scope of total income, residence and tax liability, income which does not form part of total income. Deduction from Gross total income.
2. Head of the Income: Salaries; Income from house property; Profit and gains to business or profession. Capital gains; Income from other sources.
3. Computations of total income of an individual, H.UF and firm.
4. Deemed income: Aggregation of Income, Set-off and carry forward of losses; Tax Authorities; Assessment procedures.

Contemporary Audit
1. Introduction: Meaning and objectives of auditing : Types of audit; Internal audit. Audit Process: Audit programme; Audit and books; Working papers and evidences; Consideration for commencing an audit; Routine checking and test checking. Internal Check System: Internal Control.
3. Auditing Standards – Appointment, power, duties and liability of Auditor. Broad Outlines of Company audit and auditor’s report. Special audit Banking companies, Educational Institutions, Insurance companies. Investigation, Audit of non profit organisation, Divisible Profit & Dividend.

Indian Economic Structure

Marketing, Practice and Finance
1. Introduction: Nature and scope of marketing: Importance of marketing as a business function and in the economy; Marketing concepts- traditional and modern; Selling Vs. Marketing; Marketing mix; Marketing environment.

2. Consumer Behaviour and Market segmentation; Nature, scope and significance of consumer behaviour; Market segmentation Concept and importance; basis for market segmentation Promotion; Methods of promotion; Optimum promotion mix; Advertising media – their relative merits and limitations; characteristics of an effective advertisement; Personal selling; Selling as a career; Classification of a successful sales person; Functions of salesman.

3. Product: Concept of product, consumer and industrial goods; Product planning and development; Packaging – role and functions; Brand name and trade mark; After sales service; Product life cycle concept. Price: Importance of price in the marketing mix; Factors affecting price of a product / service; Discounts and rebates.

4. Distribution Channels – concept and role; Types of distribution channels; factors affecting choice of a distribution channel; Retailer and wholesale; physical distribution of goods; Transportation; warehousing; inventory control; order processing.

Macro- Economics


Trade of India

2. Foreign Trade of India – Brief history before independence. Recent trends in India’s Foreign Trade. Composition of Imports and Exports – Changes during planning period. Important items of imports and exports.

3. Direction of India’s Foreign Trade – Changes in Directional pattern during planning period. India’s Major trading partners. State trading Organisations, Financing of India’s foreign trade role of EXIM, Bank ECGC and other institutions in financing of foreign trade, STC MMTC.


Applied & Business Statistics


Law and Practice of Banking
1. The Ordinary, practice of bankers with regard to the opening and conduct of banking accounts, closing of accounts. Banker and customer – General and special relations.

2. Law relating to cheques, bill of exchange and other negotiable instruments. Discounting of Bill of Exchange, the practice relating to cheques bills of exchange and other negotiable instruments.

3. Banker’s credit, advance and overdrafts Traveller cheque, letter of credit, confirmed bankers credit, unconfirmed bankers credit, acceptance credits and documentary credit.

4. Revolving credit, banker’s advance against marketable securities, goods & produce, debentures and life insurance policies. Unsecured advances – guarantees, precautions/ duties of Banker.

Development Banking
1. Meaning, determinant and obstacles of economic development, sources and problems of Rural and Industrial Finance.

2. Meaning objective, characteristics and functioning of Development Banks, Difference between Commercial and Development Banks

3. Role of Commercial Banks in Agricultural and Industrial Finance. Terms lending operations of Land Development Banks.

5. Structure of Development Banks in India, progress of these banks (terms lending institutions) and deficiencies in their working.


7. State level Financial Corporation – SFCs and SIDCs – their objectives, organizations, functions and evaluations of performance.

8. Capital Market in India & Industrial Growth – Structure, present position, problems and steps taken by the government to active and Capital market.

**Quantitative Economics**


2. Linear programming – Meaning, Application, limitation Simple formulation, Graphic method, simplex method duality.


4. Decision Theory Decision making under risk, decision making under inconstancy-Maximum Criterion, Maximax Criterion, Hurvics, criterion savage criterion, laplace criterion Inventory Economics – Inventroy costs, various inventroy models – EOQ with uniform demand, production inventory model, Back-order inventory model. Inventory model with quantity discount, price break approach, Re-order point safety stock and stock-outs, determining optimum safety stock levels, ABC analysis.

5. Input- Output Analysis – Meaning assumption viability of system, technological coefficient closed & open economy, determination of out-put labour requirement price equilibrium and value added.

**Entrance Test for the Course(s):** MBA (Management Studies) [CUHAR], (Master of Business Administration) [CURAJ], [CUKNK], [CUJAM], [CUTND] [CUKER], (Master of Business Administration (Marketing Management)) [CUJAM], (Master of Business Administration (Human Resource Management)) [CUJAM], (Master of Business Administration (Executive)) [CUJAM], (Master of Business Administration (Tourism and Travel Management)) [CUJAM], [CUKER] [CUKNK], (Master of Business Administration (Agri-businesses)) [CUPUN], (Master of Business Administration (Tourism and Hospitality Management) [CUTND], (Master of Business Administration (Textile Management)) [CUTND], (Master of Business Administration (Apparel Management)) [CUTND], (Master of Business Administration (Retail Management)) [CUTND], MTTM (Tourism and Hotel Management) [CUHAR], MHMCT (Tourism and Hotel Management) [CUHAR]

The question paper will comprise of 100 MCQs from the following discipline. *i.e.*

- **English/Verbal Ability:** Reading comprehension, verbal reasoning, syllogisms, analogies, antonyms and synonyms, fill in the blanks, sentence correction, idioms, etc.

- **Maths/Quantitative Ability:** Number systems, geometry, trigonometry, probability, permutation combination, algebra, mensuration, time and work, averages, percentages, profit and loss, quadratic and linear equations, etc.

- **Data Interpretation:** Interpretation and analysis of data based on text, tables, graphs (line, area), charts (column, bar, pie), venn diagram, etc.

- **Logical Reasoning:** Clocks, calendars, binary logic, seating arrangement, blood relations, logical sequence, assumption, premise, conclusion, linear and matrix arrangement, etc.

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Entrance Test for the Course(s): M.A. (Fine Arts) [CUPUN]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following syllabus:

   **Art history:** European art history, Indian art history. Renascence in art, paintings painted during renascence. Post renascence paintings, painters in Indian and Europe. Biographies of European and Indian painters, Museums and art galleries of India

   **Fundamentals of art:** Types and expressions. Painting from memory, painting an object, Calligraphy, types of fonts and medium.

   **Sculpture:** Indian sculpture, Iconography in Indian and European Art. Carving tools and stones. Famous sculptures of India and Europe.

   **Printing Technology:** Lithography, offset, screen printing, inkjet and other methods of printing. Types of paper and paper sizes. Etching and methods of pattern transfer.

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**Entrance Test for the Course(s):** M.Lib.I.Sc. (Library and Information Science) [CUGUJ] [CUHAR] [CUPUN] [CUTND], M.A. (National Security Studies) [CUJAM], (Cultural Informatics) [CURAJ], (Development Studies) [CUSBR], (Defense and Strategic Studies) [CUGUJ], (Tibetan) [CUJHD], (Folkloristic and Tribal Studies) [CUKNK], (Folklore) [CUJHD], (Anthropology) [CUJHD], (Gandhian Thought and Peace Studies) [CUGUJ], (Gender Studies) [CUGUJ], M.Sc. (Digital Society) [CURAJ], PG Diploma (Media writing & digital communication) [CURAJ], (NRI Laws) [CUKER], (Indian Scripts-Brahmi and Sharda) [CUJAM], (Shavism) [CUJAM], (Indian Mystical Thoughts) [CUJAM], LLB (Law) [CUHAR], Diploma (Petroleum Geosciences) [CUSBR], Certificate Course (Research Methods and Data Analysis Techniques) [CUJAM]

The question paper will comprise of 100 MCQs from the following discipline. *i.e.* English, Numerical Aptitude/Data Interpretation, Analytical Skills, Reasoning, General Aptitude, General Knowledge.

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PGQP41

**Entrance Test for the Course(s):** M.A. (Journalism and Mass Communication) [CUHAR], [CUSBR], [CUKNK], [CUPUN], (Culture and Media Studies) [CURAJ], (Mass Communication and New Media) [CUJAM], (Mass Communication) [CUTND], [CUJHD]

1. **PART-A** will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. **PART-B** will consist of **75 objective questions** (MCQs) from the following syllabus:

   • General Awareness of Indian Political and Economic Environment
   • International Developments (Political and Entertainment)
   • Awareness of current Public issues
   • Indian history and Social Science
   • Information Communication Technologies and its application in Media Industry
   • Mass Media and Society

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Entrance Test for the Course(s): M.A. (International Relations & Political Science) [CUKER], (Political Science) [CUHAR], [CUPUN], [CUGUJ], [CUAPH], (Public Policy & Public Administration) [CUJAM], (Public Policy, Law and Governance) [CURAJ], (Public Administration & Policy Studies) [CUKER], (Politics and International Relations) [CUGUJ], [CUPUN], (Political Science with specialization in International Relations) [CUJHD], (Public Administration) [CUJHD] [CUKNK], (Political Science and International Relations) [CUSBR]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following syllabus:

1. 
   b) Modern Indian Political Thought: Gandhi and Ambedkar.
   c) Political theory: Concepts of liberty, equality, justice, sovereignty, citizenship, stated. International Relations: Cold War politics, NAM, SAARC, UNO, India’s foreign policy particularly with China, Pakistan and USA.
   d) Indian Government and Politics: Making of the Constituent Assembly, parliament, cabinet, prime minister, president, state government, federalism, political parties (national and regional), elections, and local government.
   e) Comparative Government and Politics
   f) Public Policies in India

2. General issues of contemporary relevance

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**Entrance Test for the Course(s):** M.P.Ed. (Physical Education) [CUPUN] (Physical Education and Sports) [CUHAR], [CUPUN]

1. **PART-A** will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. **PART-B** will consist of **75 objective questions** (MCQs) from the following syllabus:

   1. **Historical Perspective:** Physical Education in Ancient Greece, Physical Education and Sports in Rome. Physical Education in Sparta and Athens, Physical Education in India during Ancient period.

   2. **Philosophical Perspective:** Meaning, Definition, Aims and Objectives of Physical Education. Nature, scope and Philosophy of Physical Education. Idealism, Pragmatism, Naturalism and Realism and their implication for Physical education.

   3. **Psychological Perspective:** Psycho-physical unity of human organism, laws of learning, their application to sports situations. Theories of play, Learning stages, learning curves, transfers of training. Practical application of Psychology of Physical Education. Personality and its types.

   4. **Sociological Perspective:** Orthodoxy, Customs, Traditions and Physical Education. Festivals and Physical Education. Socialization through Physical Education, Social Conglomeration and Social group, Primary group and Remote group. Features and Importance of Culture. Impact of Culture on life style.

   5. **Introduction to Sports Training:** Meaning and Definition of Sports; Aims & Objectives of Sports Training; Principles of Sports Training; System of Sports Training-Basic Performance, Good / High Performance.


   7. **Introduction to Research:** Definition of Research, Need & importance of Research in Physical Education; Classification of Research; Research problem, Meaning, Criteria of Selection of Problem, formulation of Research Problem, Limitation and Delimitations of Research.

   8. **Bio-Mechanics:** Body lever and their types; Motion: Laws of Motion; Centre of Gravity, Equilibrium; Static and Dynamic Forces, its direction and application; Speed acceleration and momentum.

   9. **Measurement and Evaluation in Physical Education:** Meaning and Importance of test, measurement and evaluation; Basic principles of evaluation; Formative and summative
evaluation; Classification of Test: Knowledge test, fitness test, Skill test; Criterion for the selection test: Validity, reliability, objectivity, norms and standard.


12. Muscles: Origin, Insertion and Action of Following: Pectoralis Major, Pectoralis Minor, Serratus Anterior, Rectus Abdominus, Trapezium, Deltoid, Teres Major, Bisceps (Bronchic), Triceps Latissimus Dorsi, Rectus Femories (Vestus Leteralis), Vestus Medialis (Vestus Intermedius)

13. Sports Injuries: Body Lever & their types, Motion, Laws of Motion, Centre of gravity, equilibrium, Static & Dynamic Forces its direction and Application, Speed Acceleration & Momentum.


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Entrance Test for the Course(s): M.A. (Economics) [CURAJ], [CUGUJ], [CUHAR], [CUJAM], [CUTND], [CUKER], [CUPUN], [CUKNK], [CUSBR], [CUAPH], M.Sc. B.Ed. (Economics) [CURAJ]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following syllabus:

Micro Economics

- **Consumer Theory or Behaviour:** Demand, Utility, Indifference Curve, Revealed Preference Theory, Consumer Surplus
- **Production Theory:** Production Function, Law of Variable Proportions, Returns to Scale, Cost Function, types and concepts
- **Price and Output determination in Market:** Perfect and Imperfect Competition (Monopoly, Price Discrimination, Monopolistic, Duopoly and Oligopoly models)
- **General Equilibrium, Efficiency and Welfare:** Equilibrium and efficiency under pure exchange and production; overall efficiency and welfare economics, externality

Macro Economics

- **National Income Accounting,**
  - **Income and Output Determination:** Aggregate Demand and Aggregate Supply, Effective Demand Principle, Classical and Keynesian Theory
  - **Money and Inflation:** Demand and Supply of Money, Money Multiplier and High Powered Money, Credit Creation, Role of Reserve Bank of India and Commercial Banks, Quantitative Theories of Money, Philip’s Curve

- **Monetary and Fiscal Policy of India and Its Role**
  - **Consumption and Investment Function:** Permanent, Relative and Life Cycle Hypothesis, determinants of business fixed investment; residential investment and inventory investment, Multiplier and Accelerator
  - **Open Economy Models:** Mundell and Fleming Model (IS,LM and BP curve), Balance of Payments, exchange rate determination, Purchasing Power Parity
  - **Economic Growth:** Harrod-Domar Model, Solow Model

- **Statistical Methods in Economics**
  - Mean, Mode, Median, Dispersion, Skewness, Quartile Deviation, Average Deviation, Standard Deviation
  - **Correlation**
    - Simple Regression Model Probability Distribution Sampling

- **Mathematical Methods in Economics**
  - Sets and Vector
    - Functions of one and several real variable
  - Single and Multi variable optimization
  - Integration of functions
Indian Economy

Overview of colonial economy.
Macro Trends: National Income; population; occupational structure.
   Agriculture: Agrarian structure and land relations; agricultural markets and institutions – credit, commerce and technology; trends in performance and productivity; famines.
   Railways and Industry: Railways; the de-industrialisation debate; evolution of entrepreneurial and industrial structure; nature of industrialisation in the interwar period; constraints to industrial breakthrough; labour relations.

Economy and State in the Imperial Context
   The imperial priorities and the Indian economy; drain of wealth; international trade, capital flows and the colonial economy – changes and continuities; government and fiscal policy.

New Economic Policy

Public Economics:
Public and Private Goods, Externalities, Budget, Deficits, Public Debt, Fiscal Federalism in India,

Taxation: its economic effects; dead weight loss and distortion, efficiency and equity considerations, tax incidence, optimal taxation.

International Trade Theories: Adam Smith, Ricardo, Heckscher-Ohlin model and New Trade Theories

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Entrance Test for the Course(s): M.Tech. (Energy Engineering) [CUJHD]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following syllabus:
   
   i. Basics of energy and
   ii. Relevant topics from Mechanical/ Electrical/ Electronics/ Chemical Engineering, and Physics and Chemistry.

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Entrance Test for the Course(s): M.A. (Psychology) [CUHAR], [CUPUN], M.A. /M.Sc. (Psychology) [CUSBR] (Sports Psychology) [CURAJ], M.Sc. (Psychology) [CUKNK], (Applied Psychology) [CUTND], [CUAPH]

1. **PART-A** will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. **PART-B** will consist of **75 objective questions** (MCQs) from the following syllabus:

   Introduction to Psychology, History of Psychology, Schools of Psychology, Biological bases of Behaviour, Learning, Memory, Sensation and Perception, Emotion and Motivation, Intelligence, Personality, Psychological Testing, Life-span Development, Abnormal and Clinical Psychology, Statistics for Psychology.

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Entrance Test for the Course(s): M.A. (Gujarati) [CUGUJ]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

   **Unit:1** गुजराती साहित्याचे इतिहास (History of Gujarati literature)
   
   (a) मध्यकालीन गुजराती साहित्य (Medieval Gujarati Literature)
   
   (b) आधुनिक गुजराती साहित्य (Modern Gujarati literature)
   
   - दलपतरामांची आज पर्यंत (Dalapatram from today)
   
   (c) गुजराती साहित्याचे विविध प्रकार (Various trends in Gujarati literature)
   
   (d) गुजराती साहित्याचे इतिहास ते प्रभु (History of Gujarati literature)

   **Unit:2** साहित्य सिद्धांत (Literary formulas)

   (a) भारतीय साहित्यविद्या (Indian literature)
   
   (b) पश्चिमी साहित्यविद्या (Western literature)
   
   (c) साहित्यिक वाढ (Literary Isms)

   **Unit:3** गुजराती विवेचन (Gujarati critique)

   **Unit:4** लूंगुलच (Linguistics)

   **Unit:5** विद्युसाहित्य/ तुलनात्मक साहित्य
   
   (Universities / Comparative Literature)

   **Unit:6** साहित्य अने आंतरराष्ट्रीय (Literature and Inter-disciplines)

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**Entrance Test for the Course(s): M.A. (Chinese) [CUGUJ]**

1. **PART-A** will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. **PART-B** will consist of **75 objective questions** (MCQs) from the following syllabus:

   1. Chinese Language based questions (from elementary to advanced level including grammar, sentence structure, idioms, idiomatic expressions, synonyms, anonyms, arranging various sentences in a meaningful construction etc.)

   2. Questions based on: Chinese history, culture, society, Chinese / CPC politics and government structure, Chinese geography, General awareness about current affairs concerning China, Chinese literature etc.
Entrance Test for the Course(s): M.A. (German Studies) [CUGUIJ]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following syllabus:
   
   – Language structures, usage & grammar (CEFR1 Level = B2.2)
   – History, Geography & Current Affairs of the German-speaking countries
   – German Literature – Grimm’s Fairytales, Fables, post-1945 Short Stories, important figures from the History of German Literature
   – Translation from German « English
   – Basics of Linguistics
PGQP50

Entrance Test for the Course(s): M.Sc. (Nanosciences) [CUGUJ]

1. **PART-A** will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. **PART-B** will consist of **75 objective questions** (MCQs) from the following syllabus:

**INORGANIC CHEMISTRY**

Quantum numbers and their significance. s, p, d, f block elements, the long form of periodic table. Detailed discussion of the following properties of the elements, with reference to s & p-block. Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table. General characteristics, types of ions, size effects, radius ratio rule and its limitations. Packing of ions in crystals. Born-Landé equation with derivation and lattice energy. Madelung constant, Born-Haber cycle and its application, solvation energy. Lewis structure, Valence Bond theory, Molecular orbital theory. Formal charge, Valence shell electron pair repulsion theory (VSEPR), Redox equations, Standard Electrode Potential and its application to inorganic reactions. Bronsted-Lowry concept of acid-base reactions, solvated proton, relative strength of acids, types of acid-base reactions, levelling solvents, Lewis acid-base concept, Classification of Lewis acids, Hard and Soft Acids and Bases (HSAB) Application of HSAB principle. Inert pair effect, diagonal relationship Allotropy and catenation. Complex formation tendency of s and p block elements. Study of the compounds with emphasis on structure, bonding, preparation, properties and uses. Boric acid and borates, boron nitrides, borohydrides (diborane) carboranes and graphitic compounds, silanes, Oxides and oxoacids of nitrogen, Phosphorus and chlorine. Peroxo acids of sulphur, interhalogen compounds, polyhalide ions, pseudo halogens and basic properties of halogens. Werner’s theory, valence bond theory (inner and outer orbital complexes), electro neutrality principle and back bonding. Crystal field theory, measurement of 10 Dq (Δo), CFSE in weak and strong fields, pairing energies, factors affecting the magnitude of 10 Dq (Δo, Δt). Octahedral vs. tetrahedral coordination, tetragonal distortions from octahedral geometry Jahn-Teller theorem, square planar geometry. Qualitative aspect of Ligand field and MO Theory.

**PHYSICAL CHEMISTRY**

Intensive and extensive variables; state and path functions; isolated, closed and open systems; zeroth law of thermodynamics. First law: Concept of heat, q, work, w, internal energy, U, and statement of first law; enthalpy, H, relation between heat capacities, calculations of q, w, U and H for reversible, irreversible and free expansion of gases (ideal and van der Waals) under isothermal and adiabatic conditions. Heats of reactions: standard states; enthalpy of formation of molecules and ions and enthalpy of combustion and its applications; calculation of bond energy. Second Law:
Concept of entropy; thermodynamic scale of temperature, statement of the second law of thermodynamics; molecular and statistical interpretation of entropy. Calculation of entropy change for reversible and irreversible processes. Third Law: Statement of third law, concept of residual entropy, calculation of absolute entropy of molecules. Free Energy Functions: Gibbs and Helmholtz energy; variation of S, G, A with T, V, P; Free energy change and spontaneity. Relation between Joule-Thomson coefficient and other thermodynamic parameters; inversion temperature. Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, qualitative idea of point and space groups, seven crystal systems and fourteen Bravais lattices. Ionization of weak acids and bases, pH scale, common ion effect, Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions; derivation of Henderson equation and its applications; buffer capacity, buffer range. Kinetic molecular model of a gas: postulates and derivation of the kinetic gas equation; collision frequency. Maxwell distribution and its use in evaluating molecular velocities (average, root mean square and most probable) and average kinetic energy. Order and molecularity of a reaction, rate laws in terms of the advancement of a reaction, differential and integrated form of rate expressions up to second order reactions, experimental methods of the determination of rate laws, kinetics of complex reactions.

ORGANIC CHEMISTRY

Homolytic and Heterolytic fission with suitable examples. Curly arrow rules, formal charges; Electrophiles and Nucleophiles; Nucleophilicity and basicity; Types, shape and their relative stability of Carbocations, Carbanions, Free radicals and Carbenes. Introduction to types of organic reactions and their mechanism: Addition, Elimination and Substitution reactions. Fischer Projection, Newmann and Sawhorse Projection formulae and their interconversions; Geometrical isomerism: cis–trans and, syn-anti isomerism E/Z notations with C.I.P rules. Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Molecules with two or more chiral-centres, Distereoisomers, meso structures, Racemic mixture and resolution. Relative and absolute configuration: D/L and R/S designations

PHYSICS

Basics of classical mechanics; Laws of motion; Planck’s theory, de Broglies’s hypothesis, The Harmonic Oscillator: Schrodinger approach; Hydrogenic Atoms: Orbitals. Free electron gas in one and three dimensions. Thermionic emission, work function, electrical conductivity of the free electron gas Energy Bands: Fermi-Dirac Statistics; Holes; Effective Mass; Density of States:3D, 2D, 1D; Conduction & Valence Bands; Electrons in periodic potential, Origin of energy bands in solids, classification of solids as metals , insulators and semiconductors on the basis of the band picture, Origin of the energy gap (qualitative discussions). Temperature dependence of Fermi energy. Crystal structure, Packing fraction, specific surface energy and surface stress, effect on the lattice parameter, Bragg’s law of diffraction, Size and shape dependent optical, emission, electronic transport, refractive index, dielectric, mechanical, magnetic; quantum confinement in semiconductors; Mechanical properties – Stress and Strain concept, Elastic properties, General Optics and Optical properties - refraction, reflection, Absorption, Transmission, luminescence, Magnetic properties - paramagnetism

BIOLOGICAL SCIENCES

Evolution and origin of life, biological classification systems

Plant anatomy and physiology: plant tissues, hormones, mineral nutrition, biofertilizers and pesticides

Animal anatomy and physiology: animal tissues, blood, digestive system, respiratory system, excretion system, nervous system, endocrine system, reproduction system, skeleton system.

Cytology and molecular biology: Cell and cell organelles, cell cycle, cell division-Mitosis and meiosis, DNA, RNA, DNA replication, translation, transcription, DNA repair mechanism.


Ecology: Ecosystem, ecological pyramids, environment pollution and green house effects.

Immunology: Basics of immunology, antigens, antibody, antigen-antibody interactions, types of immunity, immunological disorders, hypersensitivity reactions, monoclonal antibodies, and immunization.

Microbiology: Classification of pathogens, Gram staining, diseases and treatments.

Genetics: Mendelian genetics, genetic disorders, and gene therapy.

Biotechnology: Molecular biology techniques including DNA transformation techniques, types of vectors, cloning and expression. Restriction enzymes, types of polymeric chain reactions (PCR), and gel electrophoresis.

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Entrance Test for the Course(s): M.Sc. (Sports Physiology) [CURAJ] (Sports Nutrition) [CURAJ] (Sports Biochemistry) [CURAJ], (Sports Biomechanics) [CURAJ]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following syllabus:

**General Biology:** Cell: Structure and Function, Cell organelles, Cell cycle and Cell Division, Biomolecules, DNA structure and Replication, Enzymes, Glycolysis and TCA cycle, Genetics and Evolution, Principles of Inheritance and variation, Human health and diseases. Microbes, Biotechnology and its application, Immune system, Digestion and Absorption, Circulatory system, Respiratory system in humans, Musculoskeletal system, Skeletal muscle and its functions, muscle contraction, Neural control and coordination, Ecosystem, Basic concept of Food and Nutrition, Macronutrients and micronutrients, Nutrient deficiencies, Water, hydration and health.

**Biochemistry:** Structure and Function of Carbohydrate, Protein, Nucleic acid, Fatty acids, Lipids and Enzymes, Bioenergetics, Glycolysis, Gluconeogenesis, Pentose Phosphate Pathway, Citric Acid Cycle, Electron Transfer System, Oxidative Phosphorylation; Metabolic Regulation of Glucose and Glycogen, Lipid Biosynthesis, Fatty Acids Catabolism, Biosynthesis, Oxidation and Production of Urea, linkage & crossing over, chromosomal aberrations, mutation, extra chromosomal inheritance, replication, transcription, translation, DNA repair, transformation, transduction.

**Human Physiology:** Cellular Physiology; Exercise and Energy Metabolism; Macronutrients, micronutrients and water, Basic energy systems and their functions, Drugs and doping; Blood, Body fluids and Endocrinology; Exercise and Muscular system: Classification of muscle, Physiological anatomy of skeletal muscle, Motor unit and All-or-none law, Muscular adaptations in response to training; Exercise and Cardiovascular system: Basic anatomy of heart and vessels, Cardiac output and cardiac cycle; Exercise and Respiratory system: Physiological anatomy of respiratory system, Internal and external respiration; Exercise and Nervous system: Nervous system types, components and their functions, Structure, types and functions of neuron, Synaptic junction; Exercise and Thermoregulation; Hypo- and hyperthermia, Mechanisms of heat exchange.

**Food and Nutrition:** Food groups and RDA, Functions, metabolism, sources and deficiency of nutrients, water, energy, CHO, proteins, fats, vitamins and minerals. Cereals and millets, Legumes and oil seeds, Fruits and vegetables, Flesh foods and Eggs, Milk and milk products, Sugar and jiggery, Fats and oils. Etiology, symptoms, and dietary management in diseases of the gastrointestinal tract, metabolic disorders, kidney diseases, diseases of cardiovascular system, diet for weight management, diet for allergic conditions. Introduction to quality control, evaluation and assurance, organization of quality control department; Food laws and standards, control of food quality, evaluation of food safety. Food adulteration- classification & detection methods of adulterants Hygiene and sanitation- issue in food safety, potable water, cleaning and
washing, cleaning agents, personal hygiene of the food handlers, food contamination and its hazards.

**Mechanics:** Scalar and Vector, Force, Momentum, velocity work, momentum, projectile motion, gravitation, circular motion, rotational motion, Simple harmonic motion, Sound waves, potential and kinetic energy, conservation of energy, Elasticity, Angular Momentum, Moment of Inertia, Radius of gyration.
Entrance Test for the Course(s): M.Tech. (Microelectronics & VLSI) [CUASM]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

**Section 1: Engineering Mathematics**
Linear Algebra: Vector space, basis, linear dependence and independence, matrix algebra, eigenvalues and eigenvectors, rank, solution of linear equations- existence and uniqueness.

Calculus: Mean value theorems, theorems of integral calculus, evaluation of definite and improper integrals, partial derivatives, maxima and minima, multiple integrals, line, surface and volume integrals, Taylor series.

Differential Equations: First order equations (linear and nonlinear), higher order linear differential equations, Cauchy's and Euler's equations, methods of solution using variation of parameters, complementary function and particular integral, partial differential equations, variable separable method, initial and boundary value problems.

Vector Analysis: Vectors in plane and space, vector operations, gradient, divergence and curl, Gauss's, Green's and Stokes’ theorems.

Complex Analysis: Analytic functions, Cauchy’s integral theorem, Cauchy’s integral formula, sequences, series, convergence tests, Taylor and Laurent series, residue theorem.

Probability and Statistics: Mean, median, mode, standard deviation, combinatorial probability, probability distributions, binomial distribution, Poisson distribution, exponential distribution, normal distribution, joint and conditional probability.

**Section 2: Networks, Signals and Systems**
Circuit analysis: Node and mesh analysis, superposition, Thevenin's theorem, Norton’s theorem, reciprocity.

Sinusoidal steady state analysis: phasors, complex power, maximum power transfer. Time and frequency domain analysis of linear circuits: RL, RC and RLC circuits, solution of network equations using Laplace transform.

Linear 2-port network parameters, wye-delta transformation.

Continuous-time signals: Fourier series and Fourier transform, sampling theorem and applications.
Discrete-time signals: DTFT, DFT, z-transform, discrete-time processing of continuous-time signals. LTI systems: definition and properties, causality, stability, impulse response, convolution, poles and zeroes, frequency response, group delay, phase delay.

**Section 3: Electronic Devices**
Energy bands in intrinsic and extrinsic semiconductors, equilibrium carrier concentration, direct and indirect band-gap semiconductors.

Carrier transport: diffusion current, drift current, mobility and resistivity, generation and recombination of carriers, Poisson and continuity equations.

P-N junction, Zener diode, BJT, MOS capacitor, MOSFET, LED, photo diode and solar cell.

**Section 4: Analog Circuits**
Diode circuits: clipping, clamping and rectifiers.

BJT and MOSFET amplifiers: biasing, ac coupling, small signal analysis, frequency response. Current mirrors and differential amplifiers.

Op-amp circuits: Amplifiers, summers, differentiators, integrators, active filters, Schmitt triggers and oscillators.

**Section 5: Digital Circuits**
Number representations: binary, integer and floating-point numbers.

Combinatorial circuits: Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, logic gates and their static CMOS implementations, arithmetic circuits, code converters, multiplexers, decoders.

Sequential circuits: latches and flip-flops, counters, shift-registers, finite state machines, propagation delay, setup and hold time, critical path delay.

Data converters: sample and hold circuits, ADCs and DACs.

Semiconductor memories: ROM, SRAM, DRAM.

Computer organization: Machine instructions and addressing modes, ALU, data-path and control unit, instruction pipelining.

**Section 6: Control Systems**
Basic control system components; Feedback principle; Transfer function; Block diagram representation; Signal flow graph; Transient and steady-state analysis of LTI systems; Frequency response; Routh-Hurwitz and Nyquist stability criteria; Bode and root-locus plots; Lag, lead and lag-lead compensation; State variable model and solution of state equation of LTI systems.

**Section 7: Communications**
Random processes: autocorrelation and power spectral density, properties of white noise, filtering of random signals through LTI systems.

Analog communications: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, superheterodyne receivers.

Information theory: entropy, mutual information and channel capacity theorem.

Digital communications: PCM, DPCM, digital modulation schemes (ASK, PSK, FSK, QAM), bandwidth, inter-symbol interference, MAP, ML detection, matched filter receiver, SNR and BER.

Fundamentals of error correction, Hamming codes, CRC.

**Section 8: Electromagnetics**
Maxwell's equations: differential and integral forms and their interpretation, boundary conditions, wave equation, Poynting vector.

Plane waves and properties: reflection and refraction, polarization, phase and group velocity, propagation through various media, skin depth.

Transmission lines: equations, characteristic impedance, impedance matching, impedance transformation, S-parameters, Smith chart.

Rectangular and circular waveguides, light propagation in optical fibers, dipole and monopole antennas, linear antenna arrays.

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Entrance Test for the Course(s): M.Tech. (Embedded and Real Time Systems) [CUKNK]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following syllabus:

OVERVIEW OF MICROCONTROLLERS

INTRODUCTION TO EMBEDDED SYSTEMS
Embedded systems over view, Design challenges, Processor technology, IC technology, and design technology. Embedded Vs General computing system, Classification of Embedded systems, Major applications and purpose of ES. Core of an Embedded System including all types of processor/controller.

INTRODUCTION TO REAL-TIME SYSTEMS

EMBEDDED COMPUTING AND ARM PROCESSORS
Complex systems and microprocessors– Embedded system design process –Design example: Model train controller- Instruction sets preliminaries – ARM Processor – CPU: programming input and output- supervisor mode, exceptions and traps – Co-processors- Memory system mechanisms – CPU performance- CPU power consumption.

EMBEDDED COMPUTING PLATFORM DESIGN
The CPU Bus-Memory devices and systems–Designing with computing platforms – consumer electronics architecture – platform-level performance analysis – Components for embedded programs.
Entrance Test for the Course(s): M.Tech. (Computer Science & Technology (Cyber Security)) [CUPUN], (Computer Science & Technology) [CUJHD], [CUPUN], [CUJAM], (Computer Science & Engg.) [CURAJ], [CUASM], (Computer Science (Cyber-Physical Systems)) [CURAJ], (Artificial Intelligence and Data Science) [CUAPH]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

**Engineering Mathematics**

1. **Theory of Probability:** Axiomatic definition of Probability, Conditional Probability Baye’s Theorem, Random Variables Functions of random variables; Probability distributions: Binomial Poisson, Exponential and Normal distribution and their moment generating functions.

2. **Set Theory & Algebra:** Sets; Relations; Functions; Composition of function and relations, Groups; Partial Orders; Boolean Algebra.

3. **Combinatorics:** Permutations; Permutations with and without repetition; Combinations; generating functions; recurrence relations.

4. **Graph and Trees:** Introduction to graphs, Directed and Undirected graphs, Homomorphic and Isomorphic graphs, Subgraphs, Cut points and Bridges, Multigraph and Weighted graph, Paths and circuits, Shortest path in weighted graphs, Eurelian path and circuits, Hamilton paths and circuits, Planar graphs, Eulers’ formula, Trees, Spanning trees.

5. **Linear Algebra:** Algebra of matrices, determinants, systems of linear equations, Eigen values and Eigen vectors.

6. **Calculus:** Limit, Continuity & differentiability, Mean value Theorems, Theorems of integral calculus, evaluation of definite & improper integrals, Partial derivatives, Total derivatives, maxima & minima.

7. **Theory of Computation:** Finite Automata and Regular Expressions, Non-determinism and NFA, Properties of Regular Sets, Context free grammar: Chomsky Normal Form (CNF), Greibach Normal Form (GNF), Push-down automata, Moore and mealy Machines, Turing machines.

8. **Digital Logic:** Number representation and computer arithmetic (fixed and floating point), Logic functions, Minimization, Design and synthesis of combinational and sequential circuits, A/D AND D/A CONVERTERS.

9. **Computer Organization and Architecture:** Machine instructions and addressing modes, ALU and data-path, CPU control design, Memory interface, I/O interface (Interrupt and DMA mode), Instruction pipelining, Cache and main memory, Secondary storage.

10. **Microprocessors and Interfacing:** instruction set, Addressing modes, Memory interfacing, Interfacing peripheral devices, Interrupts. Microprocessor architecture,
Instruction set and Programming (8085), Microprocessor applications, DMA, Interrupt and Timer.

11. Programming and Data Structures: Programming in C; Functions, Recursion, Parameter passing, Definition of data structure. Arrays, stacks, queues, linked lists, trees, priority queues and heaps, Binary search trees.

12. Algorithms: Algorithm concepts, Analyzing and design, asymptotic notations and their properties, Worst and average case analysis; Design: Greedy approach, Dynamic programming, Divide-and-conquer; Tree and graph traversals, Spanning trees, Shortest paths; Hashing, Sorting, Searching.


15. Databases: Database Concepts, ER-model, Data Models, Relational model (relational algebra, tuple calculus), RAID, Database design (integrity constraints), Normalization (up to 4th Normal forms), BCNF (Boyce code normal forms), Query languages (SQL), Data mining & data warehousing, Transactions and concurrency control, Database security; Database security issues, Discretionary access control, Mandatory & role based access control, Database audit.


Web technologies: HTML, XML, basic concepts of client-server computing
**Entrance Test for the Course(s):** M.Tech. (Material Science and Technology) [CUTND], (Nanotechnology) [CUJHD]

1. **PART-A** will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. **PART-B** will consist of **75 objective questions** (MCQs) from the following syllabus:
   - Electrons in periodic potential, Origin of energy bands in solids, classification of solids as metals, insulators and semiconductors on the basis of the band picture, Origin of the energy gap (qualitative discussions). Bloch’s theorem in one dimension, nearly free electron approximation - formation of energy bands and gaps – Brillouin zones and boundaries - the Kronig-Penney model. E-K diagram, reduced zone representation, Brillouin zone, concept of effective mass and holes, Fermi- Dirac distribution function, Density of states for electrons in band. Temperature dependence of Fermi energy.
   - Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering- Classification of nanostructures, nanoscale architecture – Effects of the nanometre length scale - surface to volume ratio – Effect of nanoscale dimensions on various properties – Structural, thermal, chemical, mechanical, magnetic, optical and electronic
properties – effect of nanoscale dimensions on biological systems. Structure of nanomaterials - comparison with conventional materials.

Top down and bottom up synthesis approach, physical and chemical techniques for nanomaterial synthesis.
Entrance Test for the Course(s): M.Tech. (Aquacultural Engg.) [CUASM], (Water Resource Development & Management) [CUASM], (Farm Machinery & Power Engg.) [CUASM], (Food Processing Engg.) [CUASM]

1. **PART-A** will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. **PART-B** will consist of 75 objective questions (MCQs) from the following syllabus:

**Engineering Mathematics**

*Linear Algebra*: Matrices and determinants, linear and orthogonal transformations, Caley-Hamilton theorem; Eigenvalues and Eigenvectors, solutions of linear equations.

*Calculus*: Limit, continuity and differentiability; partial derivatives; homogeneous function – Euler’s theorem on homogeneous functions, total differentiation; maxima and minima of function with several independent variables; sequences and series – infinite series, tests for convergence; Fourier, Taylor and MacLaurin series.

*Vector Calculus*: Vector differentiation, scalar and vector point functions, vector differential operators – del, gradient; divergence and curl; physical interpretations-line, surface and volume integrals; Stokes, Gauss and Green’s theorems.

*Differential Equations*: Linear and non-linear first order Ordinary Differential Equations (ODE); homogeneous differential equations, higher order linear ODEs with constant coefficients; Laplace transforms and their inverse; Partial Differential Equations - Laplace, heat and wave equations.

*Probability and Statistics*: Mean, median, mode and standard deviation; random variables; Poisson, normal and binomial distributions; correlation and regression analysis.

*Numerical Methods*: Solutions of linear and non-linear algebraic equations; numerical integration - trapezoidal and Simpson’s rule; numerical solutions of ODEs.

**Farm Machinery**

*Machine Design*: Design and selection of machine elements – gears, pulleys, chains and sprockets and belts; overload safety devices used in farm machinery; measurement of force, stress, torque, speed, displacement and acceleration on machine elements - shafts, couplings, keys, bearings and knuckle joints.

*Farm Machinery*: Soil tillage; forces acting on a tillage tool; hitch systems and hitching of tillage implements; functional requirements, principles of working, construction and operation of manual, animal and power operated equipment for tillage, sowing, planting, fertilizer application, inter-cultivation, spraying, mowing, chaff cutting, harvesting and threshing calculation of performance parameters - field capacity, efficiency, application rate and losses; cost analysis of implements and tractors.

**Farm Power**

*Sources of Power*: Sources of power on the farm - human, animal, mechanical, electrical, wind, solar and biomass; bio-fuels.
**Farm Power:** Thermodynamic principles of I.C. engines; I.C. engine cycles; engine components; fuels and combustion; lubricants and their properties; I.C. engine systems – fuel, cooling, lubrication, ignition, electrical, intake and exhaust; selection, operation, maintenance and repair of I.C. engines; power efficiencies and measurement; calculation of power, torque, fuel consumption, heat load and power losses; performance index, cost analysis of implements and tractors.

**Tractors and Power tillers:** Type, selection, maintenance and repair of tractors and power tillers; tractor clutches and brakes; power transmission systems – gear trains, differential, final drives and power take-off; mechanics of tractor chassis; traction theory; three point hitches - free link and restrained link operations; steering and hydraulic control systems used in tractors; tractor tests and performance; human engineering and safety considerations in design of tractor and agricultural implements.

**Soil and Water Conservation Engineering**

**Fluid Mechanics:** Ideal and real fluids, properties of fluids; hydrostatic pressure and its measurement; continuity equation, kinematics and dynamics of flow; Bernoulli’s theorem; laminar and turbulent flow in pipes, Darcy-Weisbach and Hazen-Williams equations, Moody’s diagram; flow through orifices, weirs and notches; flow in open channels, dimensional analysis – concepts of geometric dimensionless numbers.

**Soil Mechanics:** Engineering properties of soils; fundamental definitions and relationships; index properties of soils; permeability and seepage analysis; shear strength, Mohr’s circle of stress, active and passive earth pressures; stability of slopes, Terzaghi’s one dimensional soil consolidation theory.

**Agricultural Engineering**

**Hydrology:** Hydrological cycle and measurement of its components; meteorological parameters and their measurement; analysis of precipitation data; runoff estimation; hydrograph analysis, unit hydrograph theory and application; streamflow measurement; flood routing, hydrological reservoir and channel routing, Infiltration – indices and equations, drought and its classification.

**Surveying and Leveling:** Measurement of distance and area; instruments for surveying and leveling; chain surveying, methods of traversing; measurement of angles and bearings, plane table surveying; types of leveling; theodolite traversing; contouring; total station, introduction to GPS survey, computation of areas and volume.

**Soil and Water Erosion:** Mechanics of soil erosion - wind and water erosion: soil erosion types, factors affecting erosion; soil loss estimation; biological and engineering measures to control erosion; terraces and bunds; vegetative waterways; gully control structures, drop, drop inlet and chute spillways; earthen dams.

**Watershed Management:** Watershed characterization and land use capability classification; water budgeting in watershed, rainwater harvesting, check dams and farm ponds.

**Irrigation and Drainage Engineering**

**Soil-Water-Plant Relationship:** Water requirement of crops; consumptive use and evapotranspiration; measurement of infiltration, soil moisture and irrigation water infiltration.

**Irrigation Water Conveyance and Application Methods:** Design of irrigation channels and underground pipelines; irrigation scheduling; surface, sprinkler and micro irrigation methods, design and evaluation of irrigation methods; irrigation efficiencies.
**Agricultural Drainage:** Drainage coefficient; planning, design and layout of surface and sub-surface drainage systems; leaching requirement and salinity control; irrigation and drainage water quality and reuse; non-conventional drainage system.

**Groundwater Hydrology:** Groundwater occurrence; Darcy’s Law, steady and unsteady flow in confined and unconfined aquifers, groundwater exploration techniques; overview of groundwater recharge estimation and artificial recharge techniques.

**Wells and Pumps:** Types of wells, steady flow through wells; design and construction of water wells; classification of pumps; pump characteristics; pump selection and installation.

**Agricultural Process Engineering**

*Engineering properties of agriculture produce:* Physical, thermal, frictional, rheological and electrical properties.

*Evaporation and Drying:* Concentration and drying of liquid foods – evaporators, tray, drum and spray dryers; hydrothermal treatments; drying and milling of cereals, pulses and oilseeds; drying kinetics; psychrometry – properties of air-water vapor mixture.

*Size Reduction and Material Handling:* Mechanics and energy requirement in size reduction of agriculture produce; particle size analysis for comminuted solids; size separation by screening; fluidization of granular solids-pneumatic, bucket, screw and belt conveying; cleaning and grading; effectiveness of separation; centrifugal separation of solids, liquids and gases; homogenization; filtration and membrane separation.

*Processing of Agriculture Produce:* Processing of seeds, spices, fruits and vegetables; value addition of agriculture produce.

*Storage Systems:* Controlled and modified atmosphere storage; perishable food storage, godowns, bins and grain silos, packaging material and machines.

**Dairy and Food Engineering**

*Heat and Mass Transfer:* Steady state heat transfer in conduction, convection and radiation; transient heat transfer in simple geometry; working principles of heat exchangers; diffusive and convective mass transfer; simultaneous heat and mass transfer in agricultural processing operations; material and energy balances in food processing systems; water activity, sorption and desorption isotherms.

*Preservation of Food:* Kinetics of microbial death – pasteurization and sterilization of milk and other liquid foods; preservation of food by cooling and freezing; refrigeration and cold storage basics and applications.

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**Entrance Test for the Course(s):** M.Tech. (Water Engg. & Management) [CUJHD]

1. **PART-A** will consist of **25 objective questions** (MCQs) and will include English, general awareness/knowledge, numerical ability.

2. **PART-B** will consist of **75 objective questions** (MCQs) from the following syllabus:

   **Fluid Mechanics:**

   Physical properties of Rock forming Minerals, introduction of Rocks, mode of formation and classification of sedimentary and igneous rocks, agents of metamorphism and zone of metamorphism, physical and engineering properties of some important rocks, Weathering; mechanical and chemical weathering; Erosion.

   **Surveying and Levelling:**
   Plane and geodetic surveying; classification of surveying; basic principles; measurement of horizontal distance by conventional methods; taping on sloping ground, offsets, errors and sources of errors, field book. Levelling: definition of terms; levelling principle; levelling, instruments; types of spirit levelling; methods of booking and reduction of levels; sensitiveness of level tube; errors in levelling; curvature and refraction correction. Compass Survey, Plane Table Surveying, Area and Volume Computation: computation of area by different methods.

   **Mechanics of Solids:**
   Theories of Elastic Failure: Introduction; Comparison and Significance of Various Theories, Distribution of Bending and Shear Stresses across cross-section of Beams; Shear Centre; Theory of Shear Flow; Shear Flow Diagrams; Shear Centre for Thin-Walled Symmetrical Sections, Basic Elastic Theorems and Energy Methods; Theorem of Complementary Energy; Principle of Minimum Strain Energy; Concepts of Stiffness and Flexibility.

Hydrology:


Geotechnical Engineering: Nature of Soil, Phase Representation and Relationships, Structure of soil; soil texture; Size and range of soil particles; shapes of individual sand and clay particles; field identification of soils; Introduction to particulate behaviour. Three-phase system: representation by Phase diagram – soil solids, water and air; Basic definitions and relationships: Specific gravity; Void ratio; Porosity; water content; Unit Weights: bulk, dry, saturated, submerged and natural; Degree of saturation and Density index. Nature of Soil, Phase Representation and Relationships, Structure of soil; soil texture; Size and range of soil particles; shapes of individual sand and clay particles; field identification of soils; Introduction to particulate behaviour. Three-phase system: representation by Phase diagram – soil solids, water and air; Basic definitions and relationships: Specific gravity; Void ratio; Porosity; water content; Unit Weights: bulk, dry, saturated, submerged and natural; Degree of saturation and Density index. Compaction, Consolidation and Shear Strength of Soil. Bearing Capacity of Shallow and Deep Foundations.

Entrance Test for the Course(s): M.Tech. (Power & Energy Engg.) [CUKNK]

1. PART-A will consist of 25 objective questions (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of 75 objective questions (MCQs) from the following syllabus:
   
i. Basics of energy and  
ii. Relevant topics from mechanical/ electrical/ electronics/ chemical engineering, and Physics and Chemistry.