Syllabus and Sample Questions for Entrance Test of M.Sc. Mathematics for session 2019-20

Syllabus for Entrance Test

The Entrance Test will consist of 60 Multiple Choice Questions, carrying one mark each. It covers the complete present syllabus of Elective Mathematics subject of B.A. /B.Sc. Part: I, II, and III of GNDU, Amritsar (as per below Syllabus). Candidates are required to fill the correct choice of answer on the OMR sheet with black pen only. There will be no negative marking. The duration of this test will be 90 minutes.

Sample questions

Q. 1. The equation of the tangent at the point of the parabola \( y^2 = 8x \), whose ordinate is 4, is given by

(A) \( x + y - 2 = 0 \)  
(B) \( x - y + 2 = 0 \)  
(C) \( x + y + 2 = 0 \)  
(D) \( x - y - 2 = 0 \)

Q. 2. If \( S \) be any closed surface then \( \int_S \text{curl} \ F \cdot d\vec{S} \) is

(A) 1  
(B) -1  
(C) 0  
(D) \( \infty \)

Q. 3. For the function \( f(x, y) = 3x^2 - 2xy + y^2 - 8y \), the point (2,6) is

(A) Saddle point  
(B) minima  
(C) maxima  
(D) none of these

Q. 4. The function \( f(x) = |4 - x^2| \) is

(A) continuous everywhere  
(B) discontinuous at \( x = 2 \)  
(C) discontinuous at \( x = -2 \)  
(D) continuous only at \( x = \pm 2 \).

Q. 5 The curve defined by \( f(x) = x^3 - x^2 + 1 \) has asymptotes

(A) x-axis  
(B) y-axis  
(C) \( y = x \)  
(D) none of these

Q. 6. Let \( A \) be the matrix of order \( m \times n \) then which of the following is true:

(A) rank \( A \leq \min \) of \( m \) and \( n \)  
(B) rank \( A \geq \min \) of \( m \) and \( n \)  
(C) rank \( A < \min \) of \( m \) and \( n \)  
(D) rank \( A = \min \) of \( m \) and \( n \)

Q. 7 The particular integral of differential equation \( (D^2 + 4)y = \sin 3x \) is obtained as

(A) \( -\frac{1}{5} \sin 3x \)  
(B) \( \frac{1}{5} \sin 3x \)  
(C) \( -\frac{1}{5} \sin x \)  
(D) \( -\frac{1}{5} \sin 5x \)

Q. 8. The distance between two parallel planes \( 2x + y + 2z = 8 \) and \( 4x + 2y + 4z + 5 = 0 \) is

(A) 32  
(B) 35  
(C) 30  
(D) None of These

Q. 9 \( \lim_{n \to \infty} \left( \frac{\log n}{n} \right) \) is equal to

(A) 0  
(B) 1  
(C) e  
(D) Does not exist

Q. 10. A root of the equation \( 3x^3 - 8x^2 + px + q = 0 \), where \( p \) and \( q \) are real numbers, is \( 3 + i\sqrt{3} \). The real root of the equation is.

(A) 2  
(B) 6  
(C) 9  
(D) 12
Time: 3 Hours  
Marks: 50

Instructions for the Paper Setters:
1. Syllabus of this paper is split into two Parts: Section–A and Section–B. Five questions will be set from each Section.
2. The student will attempt five questions in all selecting at least two questions from each section.
3. Teaching time for Mathematics would be six periods per week for each paper.

Section–A

Section–B

Books Recommended:
Time: 3 Hours                     Marks: 50

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Section–A
Real number system and its properties, lub, glb of sets of real numbers, limit of a function, Basic properties of limits, Continuous functions and classification of discontinuities, Uniform continuities, Differentiation of hyperbolic functions, Successive differentiation, Leibnitz theorem, Taylor's and Maclaurin's theorem with various forms of remainders, Indeterminate forms.

Section–B
De–Moivre's Theorem and its applications, circular and hyperbolic functions and their inverses. Exponential and Logarithmic function of a complex numbers, Expansion of trigonometric functions, Gregory's series, Summation of series.

Books Recommended:
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SECTION–A


SECTION–B


Books Recommended:

B.A./B.Sc. (Semester System) (12+3 System of Education) (Semester–II) (Session 2016-17)

(Faculty of Sciences)

SEMESTER–II

MATHEMATICS

PAPER–II: CALCULUS

Time: 3 Hours

Marks: 50

Instructions for the Paper Setters:

1. Syllabus of this paper is split into two Parts: Section–A and Section–B. Five questions will be set from each Section.
2. The student will attempt five questions in all selecting at least two questions from each section.
3. Teaching time for Mathematics would be six periods per week for each paper.

SECTION–A

Limit and Continuity of functions of two variables, Partial differentiation, Change of variables, Partial derivatives and differentiability of real–valued functions of two variables, Schwartz’s and Young’s Theorem, Statements of Inverse and implicit function theorems and applications, Euler’s theorem on homogeneous functions, Taylor’s theorem for functions of two variables, Jacobians, Envelopes. Evolutes, Maxima, Minima and saddle points of functions of two variables, Lagrange’s undetermined multiplier method.

SECTION–B

Double and Triple Integrals, Change of variables. Applications to evaluation of areas, Volumes, Surfaces of solid of revolution, Change of order of integration in double integrals.

Books Recommended:


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**Section–A**


**Section–B**

Partitions, Upper and lower sums. Upper and lower integrals, Riemann integrability. Conditions of existence of Riemann integrability of continuous functions and of monotone functions. Algebra of integrable functions. Improper integrals and statements of their conditions of existence. Test of the convergence of improper integral, beta and gamma functions.

**Books Recommended:**

B.A./B.Sc. (Semester System) (12+3 System of Education) (Semester–III) (Session 2017-18)

(Faculty of Sciences)

SEMESTER–III

MATHEMATICS

PAPER–II: ANALYTICAL GEOMETRY

Time: 3 Hours  Marks: 50

Instructions for the Paper Setters:

1. Syllabus of this paper is split into two Parts: Section–A and Section–B. Five questions will be set from each Section.
2. The student will attempt five questions in all selecting at least two questions from each section.
3. Teaching time for Mathematics would be six periods per week for each paper.

Section–A

Transformation of axes, shifting of origin, Rotation of axes, The invariants, Joint equation of pair of straight lines, equations of bisectors, Parabola and its properties. Tangents and normal, Pole and polar, pair of tangents at a point, Chord of contact, equation of the chord in terms of mid point and diameter of conic.

Section–B

Ellipse and hyperbola with their properties. Tangents and normal, Pole and polar, pair of tangents at a point, Chord of contact, Identifications of curves represented by second degree equation (including pair of lines). Intersection of three planes, condition for three planes to intersect in a point or along a line or to form a prism. Change of axes, Shift of origin, rotation of axes. Sphere, Section of a sphere by a plane, spheres of a given circle. Intersection of a line and a sphere. Tangent line, tangent plane, power of a point w.r.t. a sphere, radical planes.

Books Recommended

Time: 3 Hours

Instructions for the Paper Setters:
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2. The student will attempt five questions in all selecting at least two questions from each section.
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Section–A
Composition and resolution of forces (parallelogram law, triangle law, polygon law, Lami’s Theorem, (3-µ) theorem).
Resultant of a number of coplanar forces, parallel forces. Moments, Varignon’s theorem of moments, Couples,
Resultant of two Coplanar Couples, Equilibrium of two coplanar couples, Resultant of a force and a couple.
Equilibrium of coplanar forces. Friction, Laws of friction, Equilibrium of a particle on a rough plane. Centre of
Gravity: Centre of gravity of a rod, triangular lamina, solid hemisphere, hollow hemisphere, solid cone and hollow
cone.

Section–B
Vector differentiation, Gradient, divergence and curl operators, line integrals, Vector identity, Vector integration,
Theorems of Gauss, Green, Stokes and problems based on these.

Books Recommended:
B.A./B.Sc. (Semester System) (12+3 System of Education) (Semester–IV) (Session 2017-18)
(Faculty of Sciences)
SEMESTER–IV
MATHEMATICS
PAPER–II: SOLID GEOMETRY

Time: 3 Hours \hspace{1cm} \text{Marks: 50}

Instructions for the Paper Setters:
1. Syllabus of this paper is split into two Parts: Section–A and Section–B. Five questions will be set from each Section.
2. The student will attempt five questions in all selecting at least two questions from each section.
3. Teaching time for Mathematics would be six periods per week for each paper.

Section–A
Cylinder as surface generated by a line moving parallel to a fixed line and through fixed curve. Different kinds of cylinders such as right circular, elliptic, hyperbolic and parabolic in standard forms, Cone with a vertex at the origin as the graph of homogeneous equation of second degree in x, y, z. Cone as a surface generated by a line passing through a fixed curve and fixed point outside the plane of the curve, right circular and elliptic cones.

Section–B
Equation of surface of revolution obtained by rotating the curve about the z-axis in the form of . Equation of ellipsoid, hyperboloid and paraboloid in standard forms. Surfaces represented by general equation of 2nd degree $S = 0$. Tangent lines, tangent planes and Normal plane.

Books Recommended:
Instructions for the Paper Setters:

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Section–A
Rectilinear motion in a starlight line with uniform acceleration, Newton's laws of motion. Motion of two particles connected by a string. Motion along a smooth inclined plane. Variable acceleration. Simple Harmonic Motion.

Section–B

Books Recommended:
2. F. Chorlton: Dynamics.
Time: 3 Hours

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2. The student will attempt five questions in all selecting at least two questions from each section.
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Section–A
The division algorithm, The greatest common divisor, least common multiple, The Euclidean algorithm, The Diophantine equation $ax + by = c$ Prime numbers and their distribution, The fundamental theorem of arithmetic, Basic properties of congruences, Linear congruences, Special divisibility tests.

Section–B
Functions, Mobius $\sigma$ and $\tau$Chinese remainder theorem, The Fermat's theorem, Wilson's theorem, Inversion formula, Greatest integer function, Euler's Phi function, Euler's theorem, some properties of the Phi Function.

Books Recommended:
B.A./B.Sc. (Semester System) (12+3 System of Education) (Semester–VI) (Session 2018-19)

(Faculty of Sciences)

SEMESTER–VI

MATHEMATICS

PAPER–I: LINEAR ALGEBRA

Time: 3 Hours  Marks: 50

Instructions for the Paper Setters:

1. Syllabus of this paper is split into two Parts: Section–A and Section–B. Five questions will be set from each Section.
2. The student will attempt five questions in all selecting at least two questions from each section.
3. Teaching time for Mathematics would be six periods per week for each paper.

Section–A

Definition of groups, rings and fields with examples. Definition of a vector space, subspaces with examples. Direct sum of subspaces. Linear span, Linear dependence, Linear independence of vectors. Linear combination of vectors, Basis of a vector space, Finitely generated vector spaces. Existence theorem for basis. Invariance of the number of elements of the basis set. Dimension of sum of two subspaces. Quotient space and its dimension.

Section–B


Books Recommended:

B.A./B.Sc. (Semester System) (12+3 System of Education) (Semester–VI) (Session 2018-19)  
(Faculty of Sciences)  
SEMESTER–VI  
MATHEMATICS  
PAPER–II: NUMERICAL ANALYSIS  

Time: 3 Hours  
Marks: 50  

Instructions for the Paper Setters:  
1. Syllabus of this paper is split into two Parts: Section–A and Section–B. Five questions will be set from each Section.  
2. The student will attempt five questions in all selecting at least two questions from each section.  
3. Teaching time for Mathematics would be six periods per week for each paper.  
4. The non-programmable scientific calculator is allowed in the examinations.  

Section–A  

Section–B  

Books Recommended:  
2. A. Maritava Gupta and Subash Ch. Bose: Introduction to Numerical Analysis.