

AUTOMOBILE ENGINEERING

1. Introduction to IC Engines

Classification of I.C. Engines, Parts of I.C. Engine and their materials, Cycle of operation in Four stroke and Two-stroke IC engines and their comparative study; Air standard cycles, Fuel air cycles, Actual working cycle, Rotary engine concept.

2. Fuels and combustion

Combustion phenomenon in SI and CI Engines, Ignition delay, Flame propagation, Pressure-Crank angle diagram, Abnormal combustion, Auto ignition, Detonation and Knocking.

Fuel Supply System of SI engines: mixture requirements, Fuel-Air ratio, Simple carburettor and auxiliary circuits, Injection systems: Single-point and Multipoint injection, Gasoline Direct Injection; Fuel Injection System of CI engines: Air injection systems, common rail, individual pump, distributor and unit systems. Injection pumps, Fuel injector, Types of nozzle, Electronically controlled unit fuel injection system.

3. Engine lubrication and cooling

Types of lubricants and their properties, SAE rating of lubricants, Types of lubrication systems, Necessity of engine cooling, disadvantages of overcooling, Cooling systems and their comparison: Air cooling, Liquid cooling.

4. Engine Testing and Performance

Measurement of Brake Power, Indicated Power, Frictional Power, Fuel Consumption, Air flow, BMEP, Performance characteristic of SI and CI engine, Effect of load and speed on mechanical, indicated thermal, brake thermal and volumetric efficiencies.

5. Engine Exhaust Emission and its Control

Constituents of exhaust emission and its harmful effect on environment and human health, Formation of NO_x, HC, CO and particulate emissions, Methods of controlling emissions; Catalytic converters, particulate traps, Exhaust Gas Recirculation, EURO and BHARAT norms, Alternative Fuels Alcohol, Hydrogen, Natural Gas and Liquefied Petroleum Gas, Biodiesel, Biogas, merits and demerits as fuels.

6. Chassis and Transmission

Chassis types, Types of frames, Function requirements of Flywheel and clutch, Single-plate and Multi-plate clutches, Fluid Coupling, Purpose and Necessity of gear box, Constant mesh, Sliding mesh and Synchromesh gear box, Torque converters, Rear-wheel drive and front-wheel drive layouts, Universal joints, Differential gears, Four wheel drive system.

7. Braking, Suspension and Steering

Requirement and Types-Block Brakes, Band Brakes, Hydraulic brake, Air Brake, Endurance Brake, Types of suspension systems, Shock dampers, steering mechanism, steering gears, wheel alignment angles, power-assisted steering, four-wheel steering.

8. Vehicle Dynamics

Equation of Simple Spring Mass System of Two Masses, Road Load, Aerodynamics-Drag, Side force, Lift force, Rolling Resistance, Sources for vehicle vibration, vibration isolation, Effects of damping the vibration, vibration absorbers, pitch and bounce motion frequencies, Vehicle dynamic Control, Sensors for Automobile Control.

9. Automotive Electrical and Electronic Systems

Battery and its requirement, charging system, electrical and electronic ignition systems, Electronic control module, Electronic spark timing, Indication and warning devices, wipers and other accessories.

10. Automotive Maintenance and Safety

Types of maintenance, repair and maintenance for common problems in engine, Introduction to vehicle safety, Basic concepts of vehicle safety, Risk evaluation and communication, Human error control, Crash Testing, Antilock braking system, Introduction to motor vehicle rules and act.