

भाग-स

पाठ्यक्रम

उप अभियंता (विद्युत / यांत्रिकी)

**SYLLABUS FOR COMBINED RECRUITMENT
EXAMINATION OF SUB ENGINEER (E/M)**

(A) Common Question for All

100 Marks

(1) Applied Physics

- (a) Measurement of vectors.
(Fundamental units, derived units, unit system, S.I. Units) force, motion and gravitation, classification of motion (characteristics of different type of motion. Newton's law of motion, speed, velocity, Acceleration, equation for motion and friction, circular and rotary motion.
- (b) High temperature measurement, kinetic theory of gases.
- (c) Thermodynamics, 1st law of thermodynamic, Isothermic adiabatic changes and latent heat.

(2) Applied Chemistry

- (a) Metal and metallurgy its alloy corrosion and protection
- (i) Occurrence, extraction, properties and engineering uses of metal with its alloy.
- (ii) Corrosion, Cause of corrosion and its control.
- (b) Fuel Explosive, classification and application.
- (c) Water treatment.
- (d) pollution-meaning, Causes of pollution, effect and Prevention.

(3) Applied Mechanics

- (a) Work, power and Energy.
Definition, form of energy, Conservation of power energy, power of engine and pumps, relation between heat and Mech.works.
- (b) Simple lifting machines
Law of Machine, study of machine, wheel axle, pulley, jacks worm and worm wheel.
- (c) Transmission of power.
Transmission of power through belt, rope and gear, gear train, spur helical, bevel gears.

(4) Strength of Material

- (i) Simple stress & strain.
Introduction, type of stress and strain etc.
- (ii) Mechanical properties & testing of materials,
Definition, necessity of testing, type of test etc.

PC

- (1) **Thermal Engineering**
- (i) Basic concept of thermo dynamics 1st and IInd law of thermo dynamics.
 - (ii) Internal combustion engines (Introduction, function of two strokes, four strokes, efficiency, Mech. Efficiency, Lubrication of I.C. Engine.
 - (iii) Air compressor, classification and its application.
 - (iv) Heat Transfer-Modes of Heat Transfer and its application.
- (2) **Basic electrical Engineering**
- (i) D.C. circuit- Ohm's law, Resistance and Resistivity, Kirchhoff's law, Series and Parallel Combination of Resistance.
- (3) **Electromagnetism**
- (i) EMF due to electric current in conductor, Magnetic field due to a coil, magnetic field due to solenoid, force on a current carrying conductor, Fleming left hand rule. Electromagnetic Induction, Farada's laws of electro-Magnetic induction, Fleming right hand rule, self induction, mutual induction, Alternating voltage and current, three phase circuit.
- (4) **Transformer**
- Principle of operation of Transformer, Transformer Ratio, Transformer on load, effect of core losses, effect of magnetization, eddy current loss, Hysteresis loss, efficiency of Transformer, D.C. machine, motor and three phase induction motor principle of working of induction motor, Starting of induction motor.
- (5) **Theory of Machines**
- Introduction of theory of machine, velocity, acceleration and friction, fly wheel, and crank efforts, power transmission gears and gear train, Governor Cam and followers etc. Lathe, Boring, Milling, Machines, Grinding & finishing process, jigs & Fixtures, machine tools etc.
- (6) **Fluid mechanic and Hydraulics**
- (i) Fundamental of Fluid flow and Pressure and its measurements. Basic equations of fluid flow.
 - (ii) Pumps – Types of pumps and selection of Pumps.

(B) Electrical

50 Marks

(1) Introduction to A.C. Machines

- * Overview of AC Machines
- * Difference between A.C. & D.C. machines.

(2) Basic Feature of A.C. Machines.

- * Parts of A.C. Machine & their functions
- * Materials for the various parts
- * Stator & rotor windings

(3) Alternators

- * Types of alternators
- * Principle & EMF equation
- * Winding factors & its effect on induced EMF.
- * Effect of speed & excitation on induced EMF.
- * Different excitation systems
- * Excitation system used in modern alternators
- * Concept of leakage, armature & synchronous reactance
- * Principle of working of brushless alternators
- * Applications

(4) A.C. Motors.

- * Types of A.C. motors
- * Stator & rotor parts, function, windings
- * Concept of rotating magnetic fields
- * Stator & rotor current equations
- * Effect of frequency on slip
- * Torque equations
- * Condition for maximum torque
- * Circle diagram
- * Necessity of induction motor starters and different types
- * Different types of induction motors

(5) HVDC/HVAC System

- * Merits & Demerits
- * Types of DC links
- * Controlled Rectification & Filters
- * Reactive Power requirements
- * Controlled characteristics

(6) Inverters

- * Need of inverter
- * inverter circuits using SCR in series and parallel mode
- * Circuit diagram of emergency tube light

(7) Converters

- * Need of converter, Types of converter (DC to DC and AC to AC)
- * Block diagram of chopper
- * Circuit diagrams of chopper using switching transistor and SCRs
- * Need of Commutation, methods
- * Single phases and three phase cycloconverter

(8) Regulated Power Supply

- * Need of regulation
- * Zener regulated DC power supply and its limitations
- * Working of shunt and series regulated power supply using transistor
- * IC regulated power supplies (Circuit diagram)
- * Block diagrams of (SMPS) switch mode power supply
- * AC stabilizer using tap changer
- * Block diagram of servo stabilizer

(9) Speed Control of Motors

- * Advantages of speed control
- * Separately excited DC motor single and three phases controlled rectifiers
- * Methods of speed regulation, fields failure protection armature current limiter (Block diagrams)
- * Dual rectifier for reversal of rotation
- * Speed control by chopper (block diagram)
- * Circuit diagrams of speed control of single phase and three phase induction motor cycloconverter (Slip ring)

(C) Mechanical

50 Marks

- (1) Introduction
- (2) Air Refrigeration Cycles
- (3) Vapour Compression Cycle
- (4) Vapour Absorption System
- (5) Refrigerant
- (6) Vapour Compression System Components
- (7) Air Conditioning & Psychrometric Processes
- (8) Cooling Load Calculation
- (9) Air Distribution Systems
- (10) Air Conditioning Systems
- (11) Fundamentals of Estimating
- (12) Estimation of Material Cost
- (13) Introduction (Vehicle Layouts and Types)
- (14) Automobile Engines (Power Plant)
- (15) Fuel Systems for Petrol Engine
- (16) Fuel System for Diesel Engine
- (17) Auto-Electric System
- (18) Transmission & Propeller Shaft

- (19) Final Drive & Rear Axle
- (20) Steering & Front Axle
- (21) Brakes
- (22) Suspension Systems
- (23) Wheels and Tyres
- (24) Automobiles Emissions and its Control