INDICATIVE SYLLABUS FOR THE POST OF ASSISTANT ENGINEER (MECHANICAL)
SECTION-A

General Intelligence and Reasoning: The questions shall be designed to test the candidate's ability to deal with abstract ideas and symbols and their relationships, arithmetical computations, and other analytical functions. The syllabus may include both verbal and non-verbal reasoning, such as analogies, similarities and differences, space visualization, problem-solving, analysis, judgment, decision-making, visual memory, discrimination, observation, relationship concepts, arithmetical reasoning, verbal and figure classification, coding-decoding, statement conclusion, syllogistic reasoning, etc.

General Awareness: Questions shall be aimed at testing the candidate's general awareness of the environment and its application to society. The test may include questions relating to History, Culture, Geography, Economic, Science, General Polity, Indian Constitution, Scientific Research, Environmental Issues, Sports, Important Days, Awards and Honours, and Current Affairs of National and International importance.

Arithmetical and Numerical Ability: Questions shall be designed to test the candidate's knowledge of number systems, computation of whole numbers, decimals and fractions, relationships between numbers, percentages, ratio and proportion, averages, interest, profit and loss, discount, time and distance, time and work, basic algebra, mensuration, data interpretation, and other arithmetical concepts involving real-life problem-solving.

English Comprehension: The test shall assess the candidate's ability to understand and use correct English. The syllabus may include vocabulary, grammar, sentence structure, synonyms and antonyms, spellings, error detection, sentence improvement, comprehension passages, and basic writing ability.

SECTION-B

1: Turbomachines

Classification - Basic laws and equations.
Hydraulic turbines; Pelton, Francis, and Kaplan turbines - Turbine efficiencies - Cavitation in turbines.
Centrifugal pumps; theory, components, and characteristics - Cavitation - Axial flow pumps.
Centrifugal and axial flow compressors; slip, surging and choking.

2: Strength of Materials

Axial and shear stresses and strains
Shear force and bending moment diagrams for beams subjected to different types of loads – Theory of simple bending and assumptions.
Springs
Torsion of solid and hollow circular shafts – Power transmission, strength and stiffness of shafts.
Testing of Materials & Strength

3: Engineering Thermodynamics

Review of basic concepts of thermodynamics
Vapour power cycles - Rankine cycle - Otto, Diesel, dual, Stirling and Brayton cycles.

4: Thermal Engineering

Reciprocating air compressors - types - construction - Compressor efficiencies and mean effective pressure.
Working of two and four stroke engines for SI and CI engines

5: Material Science & Engineering Metallurgy

Atomic Arrangement and Phase Diagrams - Structure of metals and alloys, Critical temperature - Plain carbon steel and other steels.
Heat Treatment of steel.
Structure of Composites, Plastics, Adhesives
Corrosion & its Prevention
Testing of Materials - tensile testing procedure, stress strain curve Hardness testing, Fatigue testing: Creep testing.

6: Mechanics of Machines

Mechanisms - classification of mechanisms, Kinematic inversions, slider crank mechanism
Gears Trains - Law of gearing - profile for gears
Static and dynamic force analysis of mechanisms, Balancing of rotating/reciprocating masses, Governors
Vibrations - free and forced vibrations, degree of freedom; Vibration control - Passive and active control

7: Design of Mechanical Drives

Introduction to transmission elements - Positive and friction based drives.
Design of material handling & conveying systems - flat and V-belts, rope and chain drives.
Design of various types of gears - Force analysis
Design of Shafts, couplings, screws, fasteners

8: Fluid Mechanics

Basic concepts - Fluid properties - Basic hydrostatic equation - Submerged and floating bodies.
Hydrostatic equations for incompressible and compressible fluids
Buoyancy and equilibrium of floating bodies
Fluid dynamics - Laminar and turbulent flows - Flow through pipes, Boundary layer concept - Lift & Drag

9: Industrial Economics

Demand and Supply – Forecasting techniques – Cost and Revenues.
Trade cycle – Inflation – Index numbers – Capital budgeting – Cash flow analysis – Balance sheet.
Exchange Rate determination – Marketing research – Branding.

10: Renewable Energy

Solar energy - Solar radiation - Heat transfer equations - Solar thermal energy conversion - Efficiencies - Solar photo voltaic energy.
Wind energy - Data and energy estimation, Conversion - Wind mill - Performance, applications
Hydrogen & Fuel cell concepts
Bio energy - Conversion - bio degradation - Biogas generation - Fuel properties - Biomass gasifier.