INDIAN INSTITUTE OF TECHNOLOGY MADRAS, CHENNAI-600036.

Advertisement No. IITM/R/5/2025 dated 24.09.2025

Syllabus & Scheme of Examination for the post of SENIOR TECHNICAL OFFICER

LEVEL-1 OBJECTIVE / DESCRIPTIVE TEST

Stream: Mechanical Engineering

(Candidate should attempt questions from any THREE of the following modules)

Module 1: Materials and Manufacturing

Materials: Different types and fundamentals of metals, alloys, polymers, ceramics, and composites; Iron-Carbon phase diagram; Heat treatment of steels. Manufacturing: Fitting and carpentry workshop practices on metal casting, forming, sheet metal working, machining -turning, milling, drilling, grinding; unconventional machining- EDM, water jet machining; Joining techniques- Arc welding and Gas welding; Understanding of machine tools like conventional lathe, milling, drilling, grinding; CNC machines-basic features, and part programming.

Module 2: Engineering Mechanics, Strength of Materials, Design

Engineering Mechanics: Centroid, Centre of gravity, moment of inertia, static forces and couples, conditions of static equilibrium, friction. Work, power energy. Strength of materials: Stress, strain, bending moment and shear force of beam, torque-stress relationship of shafts.. Principles and applications of : Degree of freedom of mechanism, Basic mechanisms such as 2 bar, 4 bar mechanism, Slider crank, quick return mechanism, Geneva mechanism, gear tooth profiles, spur gears, shaft and key design, various type of shaft couplings. Laboratory setups and instruments/methods of experimental measurement of force, torque, stress-strain parameters, material properties, hardness.

Module 3: Metrology

Limits-fits-tolerances for shaft and Hole based system, linear, and angular measurement instruments and calibration, comparators, measurement of surface roughness, straightness, flatness, roundness, cylindricity, screw thread, cutting force, hardness, strain, gear profile, CMM.

Module 4: Heat Power Engineering

Basics of thermodynamics: Definitions and units of mass, weight, volume, density, specific weight, specific gravity and specific volume, pressure, units of pressure, temperature, absolute temperature, heat, specific heat capacities, work, power, energy; zeroth law of thermodynamics, first law of thermodynamics for a system and control volume applicable to steady flows, second law of thermodynamics; Measurement of temperature and thermal conductivity; Parallel flow and counter flow heat exchanger experiments: finding overall heat transfer coefficient and effectiveness.

Power cycles: Carnot cycle, Air standard ideal cycles: Otto cycle, Diesel cycle, comparison of ideal and actual p-v diagrams of Otto and Diesel cycles.

Module 5: Fluid Mechanics and Fluid Power

Definition of fluid, ideal and real fluids, properties of a fluid, definition and units; pressure, units of pressure, pressure head, atmospheric, gauge and absolute pressure, Pressure measurement, U-tube manometer, differential U-tube manometer, mechanical gauges- Bourdon's gauge, diaphragm pressure gauge; velocity, pressure and flow rate measurements in pipe flow, principles of orifice meter and venturimeter; Viscosity measurement; Laboratory experiments of a centrifugal pump: components, methodology and concept of head, discharge, power, efficiency, specific speed; Laboratory experiments of a hydraulic turbines: components, methodology and concept of head, discharge, torque, power, efficiency, specific speed etc.

Module 6: Energy conversion

Layout of thermal power plant, merits and demerits of thermal power plant. Basic steam power cycles – Carnot, Rankine cycles. Refrigeration – Definition of COP, unit of refrigeration, vapour compression system, refrigerants. Air-conditioning - definition, centralised air conditioning, Components of a vapor compression refrigeration system and laboratory experiments; Classification of four stroke and two stroke engines, principles of spark ignition and compression ignition engines and their comparison, performance characteristics of a four stroke SI engine: test rig and measurement details, performance characteristics of a four stroke CI engine: test rig and measurement details.

LEVEL-2 PRESENTATION & PERSONAL INTERVIEW

The Candidates should make a brief presentation, approximately 6 slides, to the Selection Committee covering a brief profile of the applicant, contributions to research project(s) / Academic activities, Future Plans, & Contributions for IIT Madras as a Senior Technical Officer. The candidate should complete the presentation within 6 minutes.

Scheme of Examination:

Level	Type of Test	Weightage for final result
Level-1	Objective / Descriptive Test	50%
Level-2	Presentation & Personal Interview	50%

Based on the performance in the Level-1 Objective / Descriptive Test, the candidate will be shortlisted for the Level-2 Presentation & Personal Interview.

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Date: 13.01.2026

Sd/-
Registrar