

SSC Junior Engineer Syllabus for Mechanical Engineering

Scheme of Examination:

The Computer Based Examination will be conducted in two papers as indicated below:

- Paper-I
- Paper-II

Papers	Mode of Examination	Subject	Number of Questions /Maximum Marks	Duration
Paper-I	Computer Based Examination	(i) General Intelligence and Reasoning	50/ 50	2 Hours (2 hours and 40 minutes for the candidates who are eligible for scribe as per Para-9.1, 9.2 and 9.3)
		(ii) General Awareness	50/ 50	
		(iii) Part-A: General Engineering (Civil & Structural) or Part-B: General Engineering (Electrical) or Part-C: General Engineering (Mechanical)	100/ 100	
Paper-II	Computer Based Examination	Part-A: General Engineering (Civil & Structural) or Part-B: General Engineering (Electrical) or Part-C: General Engineering (Mechanical)	100/ 300	2 Hours (2 hours and 40 minutes for the candidates who are eligible for scribe as per Para 9.1, 9.2 and 9.3)

The candidates will be required to attempt the General Engineering part (i.e., Part-A, Part-B or Part-C) in Paper-I and Paper-II, which has been selected by them, on the basis of their Stream/ Subject of Educational Qualification, in the online application form. In other words, the candidates appearing from Civil Stream are required to attempt Part-A (Civil & Structural) of Paper-I and Paper-II and the candidates appearing from Electrical are required to attempt Part-B (Electrical) and the candidates appearing from Mechanical Stream are required to attempt Part-C (Mechanical) of Paper-I and Paper-II failing which their candidature will be rejected.

Paper-I & Paper-II will consist of Objective Type, Multiple-choice questions only. The questions will be set both in Hindi & English.

There will be a negative marking of 0.25 marks for each wrong answer in Paper-I and one (01) mark for each wrong answer in Paper-II.

The standard of the questions in Engineering subjects will be approximately of the level of a Diploma in Engineering (Civil/ Mechanical/ Electrical). The details of the syllabus are given below:

Syllabus for Paper I: (Computer-Based Examination)

I. General Intelligence & Reasoning:

The Syllabus for General Intelligence would include questions of both verbal and non-verbal types. The test may include questions on analogies, similarities, differences, space visualization, problem solving, analysis, judgment, decision-making, visual memory, discrimination, observation, relationship concepts, arithmetical reasoning, verbal and figure classification, arithmetical number series, etc. The test will also include questions designed to test the candidate's abilities to deal with abstract ideas and symbols and their relationships, arithmetical computations and other analytical functions.

II. General Awareness:

Questions will be aimed at testing the candidate's general awareness of the environment around him and its application to society. Questions will also be designed to test knowledge of current events and such matters of everyday observations and experience in their scientific aspect as may be expected of any educated person. The test will also include questions relating to India and its neighboring countries especially pertaining to History, Culture, Geography, Economic Scene, General Polity and Scientific Research, etc. These questions will be such that they do not require a special study of any discipline.

III. General Engineering:

Part-C (Mechanical Engineering):

Theory of Machines and Machine Design, Engineering Mechanics and Strength of Materials,

Properties of Pure Substances, 1st Law of Thermodynamics, 2nd Law of Thermodynamics, Air standard Cycles for IC Engines, IC Engine Performance, IC Engines Combustion, IC Engine Cooling & Lubrication, Rankine cycle of System, Boilers, Classification, Specification, Fitting & Accessories, Air Compressors & their cycles, Refrigeration cycles, Principle of Refrigeration Plant, Nozzles & Steam Turbines.

Properties & Classification of Fluids, Fluid Statics, Measurement of Fluid Pressure, Fluid kinematics, Dynamics of Ideal fluids, Measurement of Flow rate, Basic Principles, Hydraulic Turbines, Centrifugal Pumps, Classification of Steel.

Syllabus for Paper II: (Computer-Based Examination)

Part-C (Mechanical Engineering):

Theory of Machines and Machine Design:

Concept of simple machine, four bar linkage and link motion, Flywheels and fluctuation of energy, Power transmission by belts – V-belts and Flat belts, Clutches – Plate and Conical clutch, Gears – Type of gears, gear profile and gear ratio calculation, Governors – Principles and classification, Riveted joint, Cams, Bearings, Friction in collars and pivots Engineering

Mechanics and Strength of Materials:

Equilibrium of Forces, Law of motion, Friction, Concepts of stress and strain, Elastic limit and elastic constants, bending moments and shear force diagram, Stress in composite bars, Torsion of circular shafts, Buckling of columns—Euler's and Rankin's theories, Thin-walled pressure vessels

Thermal Engineering:

Properties of Pure Substances: p-v & P-T diagrams of pure substance like H₂O, Introduction of steam table with respect to steam generation process; definition of saturation, wet & superheated status
Definition of dryness fraction of steam, degree of superheat of steam H-s chart of steam (Mollier's Chart)

1st Law of Thermodynamics: Definition of stored energy & internal energy, 1st Law of Thermodynamics of cyclic process, Non-Flow Energy Equation, Flow Energy & Definition of Enthalpy, Conditions for Steady State Steady Flow; Steady State Steady Flow Energy Equation

2nd Law of Thermodynamics: Definition of Sink, Source Reservoir of Heat, Heat Engine, Heat Pump & Refrigerator; Thermal Efficiency of Heat Engines & co-efficient of performance of Refrigerators, Kelvin – Planck & Clausius Statements of 2nd Law of Thermodynamics, Absolute or Thermodynamic Scale of temperature, Clausius Integral, Entropy, Entropy change calculation of ideal gas processes Carnot Cycle & Carnot Efficiency, PMM-2; definition & its impossibility

Air standard Cycles for IC engines: Otto cycle; plot on P-V, T-S Planes; Thermal Efficiency, Diesel Cycle; Plot on P-V, T-S planes; Thermal efficiency. IC Engine Performance, IC Engine Combustion, IC Engine Cooling & Lubrication

Rankine cycle of steam: Simple Rankine cycle plot on P-V, T-S, h-s planes, Rankine cycle efficiency with & without pump work

Boilers; Classification; Specification; Fittings & Accessories: Fire Tube & Water Tube Boilers

Air Compressors & their cycles; Refrigeration cycles; Principle of a Refrigeration Plant; Nozzles & Steam Turbines

Fluid Mechanics & Machinery:

Properties & Classification of Fluid: ideal & real fluids, Newton's law of viscosity, Newtonian and Non-Newtonian fluids, compressible and incompressible fluids

Fluid Statics: Pressure at a point

Measurement of Fluid Pressure: Manometers, U-tube, Inclined tube

Fluid Kinematics: Stream line, laminar & turbulent flow, external & internal flow, continuity equation

Dynamics of ideal fluids: Bernoulli's equation, Total head; Velocity head; Pressure head; Application of Bernoulli's equation

Measurement of Flow rate Basic Principles: Venturi meter, Pilot tube, Orifice meter

Hydraulic Turbines: Classifications, Principles

Centrifugal Pumps: Classifications, Principles, Performance Production Engineering:

Classification of Steels: mild steel & alloy steel, Heat treatment of steel, Welding – Arc Welding, Gas Welding, Resistance Welding, Special Welding Techniques i.e., TIG, MIG, etc. (Brazing & Soldering), Welding Defects & Testing; NDT, Foundry & Casting – methods, defects, different casting processes, Forging, Extrusion, etc., Metal cutting principles, cutting tools, Basic Principles of machining with (i) Lathe (ii) Milling (iii) Drilling (iv) Shaping (v) Grinding, Machines, tools & manufacturing processes.