

9. Syllabus for main written examination :

The question of this paper will be of objective type from the Diploma courses to conduct on OMR sheets/CBRT mode. The questions will be of objective type based on the 2nd and 3rd year of Diploma in Mechanical Engineering courses of SCTE&VT.

The gist of the syllabus of the written examination is as described below. The syllabus is indicative and not exhaustive. The question will be asked from both the theory and application part on each of the topic.

a. Strength of Material

Stress and strain, Hooke's law, Young's Modulus, bulk modulus, poisson's ratio, Relation between elastic constants, Type of beams & loads, concept of shear force & bending moment, Shear Force & Bending Moment Diagrams & their salient features in cantilever beam, simply supported beam & overhanging beam under point load & UDL. Bending stress, section modulus & neutral axis. Axial load & eccentric load in columns, buckling load in columns with various end connections.

b. Engineering Materials

Material classification into ferrous, non-ferrous category and alloys, physical and chemical properties. Classification, composition and application of low carbon steel, medium carbon steel and high carbon steel. Process of heat treatment, Annealing, normalizing, hardening, tempering, stress relieving measures. Surface hardening, carburizing, and nitriding. Effect of heat treatment on properties of steel. Reasons of corrosion and surface wear, purpose of painting and methods of industrial painting.

c. Thermal Engineering / Applied thermodynamics

Thermodynamic properties of a system (pressure, volume, temperature and units of measurement). Sensible heat, latent heat, specific heat. Conceptual explanation of energy, work and heat. Introductory concept of conduction, convection and radiation of heat. Carnot cycle, Boyle's law, Charles Law, concept of I.C. engine, Otto Cycle, Diesel Cycle, Hydrocarbon fuel. Quality of I.C. engine fuels: Octane number, Cetane number.

d. Theory of Machines

Link, kinematic chain, mechanism, Cam and followers, friction between nut and screw for square thread. Screw jack. Description of roller and ball bearings. Flat collar bearings, working of simple frictional brakes. Concept of power transmission. Gear drives(Spur gear drives & worm gear drives)

e. Manufacturing technology /Production technology

Physical properties and uses of cutting tool materials. Coolants and lubricants in machining. Major components of lathe and their functions, different operations carried out in a lathe. Safety measures during machining. Shaper machine uses, major components and their functions. Types of milling machines and operations performed by them. Grinding machine and its operation. Working of cylindrical grinder, surface grinder and centre less grinder. Criteria for selection of grinding wheels, working of bench drilling machine, pillar drilling machining and radial drilling machine. Basic principle of boring. Difference between boring and drilling. Surface finishing and lapping. Welding processes and welding electrodes. TIG welding and MIG welding processes. Testing of welded joints. Jigs and fixtures, definitions and advantages of using them.

f. **Fluid Mechanics and Hydraulic machines**

Properties of fluids, definition and units of fluid pressure, pressure intensity and pressure head, concept of atmospheric pressure, gauge pressure and absolute pressure, manometers, hydrostatic pressure, centre of pressure on immersed bodies. Archimedes principle, concept of buoyancy, types of fluid flow, Bernoulli's theorem, venturimeter, pitot tube, Orifice coefficient (C_c , C_v and C_d) and relation among them. Definition of pipe, laws of fluid friction, head loss due to friction. Hydraulic gradient. Definition and classification of pumps, centrifugal pumps. Cavitation, causes and its effects. Reciprocating pumps, construction & working principle of single acting & double acting reciprocating pumps.

g. **Machine Design**

Types of loads, working stress, yield stress, ultimate stress and factor of safety, Mechanical properties of material. Design of screw thread (Nut & bolt), types of welded joints. Advantage of welded joints over other joints. Strength of welded joints. Design of solid & hollow shafts, function of keys for shafts, types of keys, Design of rectangular sunk key.

h. **Industrial Engineering & Quality Control**

Objectives of Inventory Control, Definition of Inspection and Quality Control. Types of inspection, study of factors influencing the quality of manufacture.

i. **Automobile Engineering**

Working principle of petrol engine, carburetion and air fuel ratio, battery ignition and magnet ignition system. MPFI System. Working Principle of Diesel Engine, Feed Pump Injector. Working principle of fuel injection system of multi cylinder engine. Clutch system: - need, types and working principle. Gear box and its purpose, construction and working of four speed gear box. Differential:- need, type and working principle. Braking system in automobile: types and working principle. Description of conventional suspension system for rear and front axles. Description of independent suspension system used in cars. Necessity of cooling system in Automobile Engine. Defects in cooling and their remedial measures. Function of lubrication system in I.C. engines.

10. PLACE AND DATE OF WRITTEN EXAMINATION:

(a) The Date/Time/ Venue of the Written Examination will be informed to the eligible candidates in their Admission Letters, in due course. The admission letters shall only be downloaded by the eligible candidates by accessing the Commission's website by using their 'User ID' and 'Password' from a date to be notified later on.

(b) PwD candidates intend to use Scribe/Reader should apply for permission of the Commission in writing prior to 7(seven) days of the date of Examination submitting his/her admission letter of written Test & copy of the self attested copy of disability certificate and enclosing there in the details of the scribe who will be allowed for the test. The I.D. proof and the highest educational qualification of certificate of the scribe to be used must be

