

### 8. Plan of Examination:

Stages of Examination	Type of Examination	Marks allotted	Duration	remarks
Stage-I	Main Written Examination (Objective Type)	100 Marks	1 & ½ Hours	Main written examination will be objective type to be conducted in OMR Sheet/ or CBRT.50% Weight-age will be awarded in the written examination. <b>There shall be negative marking @ 0.25 marks for each wrong answer. No marks will be awarded or deducted for any question left un-attempted.</b>
Stage-II	Career Evaluation	Rest 50 % Weight-age of career evaluation is as below 1.HSC-20% 2. Diploma in Civil Engineering-30%	--	The career evaluation shall be done as per the marks filled up by the candidates in the online application form and as per their uploaded documents. Hence candidate should enter their full Marks and marks secured both in HSC & Diploma level vigilantly. (Note-refer cautions mentioned at Page-5 of this advertisement while entering the marks.)
Stage-III	Certificate verification	--	--	Candidates up to 2(two) times the vacancies advertised in each category in order of merit basing on the marks both in Written Examination & Career evaluation shall be shortlisted for the verification of original documents. The candidate who fails to attend the document verification, his/her name will not be considered for the post.

**There shall be no viva-voce test.**

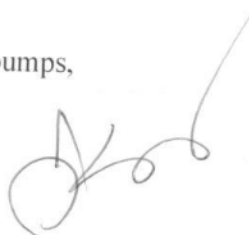
### 9. Syllabus for main written examination :

The question of this paper will be of objective type from the Diploma courses to conducted on OMR sheets/CBRT mode. The questions will be of objective type based on the 2<sup>nd</sup> and 3<sup>rd</sup> year of Diploma in Civil Engineering courses of SCTE&VT, Odisha

The gist of the syllabus of the written examination is a 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) Hydraulics

Hydrostatics, Kinematics of fluid flow, pumps,



**(b) Survey**

Introduction to surveying, Linear measurements , chaining, chain surveying, angular measurement, chain and compass surveying, computation of area, plane table surveying, levelling, contouring, principles of theodolite surveying, theodolite traversing, tacheometry, curves, setting out works, modern surveying method.

**(c) Civil Engineering materials**

Stone, Bricks, clay products and refractory materials, cement, sand, gravel, morrum and fly ash, mortar and concrete, timber, paint, varnish and distemper, iron and steel, bituminous materials, plastics, heat proofing and acoustic materials.

**(d) Construction Technology**

Introduction to construction technology, site investigation, foundations, walls, damp proofing, arches and lintels, doors and windows, floors, roofs, stairs, surface finishes, general idea of seismic planning and design of building, construction machineries.

**(e) Structural Analysis**

Trusses and frames, slope and deflection, fixed beam, continuous beam, slope deflection method, moment distribution method, three hinged arches.

**(f) Transportation Engineering**

Introduction to transportation engineering, road geometric, road materials, road pavements, hill roads, road drainage, road maintenance, construction equipments, traffic studies, landscaping and arboriculture, Introduction to railways transporting, permanent way, track materials, geometric for broad gauge, points and crossings, laying and maintenance of track, introduction to bridges, bridge site investigation, hydrology and planning, bridge foundation, bridge substructure and approaches, permanent bridges, culvert and cause ways, introduction to docks and harbours, break waters, docks, introduction to airport engineering, components of an airport, tunnel engineering.

**(g) Irrigation Engineering**

Introduction to irrigation engineering, hydrology, water requirement of crops, flow irrigation, diversion head works, regulatory works, cross drainage works, dams, water logging and drainage, ground water hydrology.

**(h) Estimating**

Introduction to estimating, detailed estimate of building as per PWD specifications/standards, analysis of rates, administrative setups of engineering organisations, detailed estimate of culverts and bridges, estimate of irrigation structures, detailed estimate of roads, PWD accounts works.

**(i) Structural Design**

Introduction to design and detailing, working stress method of design, limit state method (LSM) of design, limit state of collapse of singly reinforced members in bending, limit state of collapse in shear(Design of shear by LSM), bond anchorage, development lengths and slicing (LSM), beams(LSM) two way slabs (LSM), axially loaded short columns(LSM), ductile detailing or reinforced concrete structures subjected to seismic forces, Design of steel and timber structures (limit state), structural steel fasteners and connections, design of tension members, design of compression members, design of column bases and foundations, design of steel beams, design of timber structures, stair case(RCC-LSM), design of footings (RCC-LSM).

**(j) Public Health Engineering**



Introduction to water supply engineering, quantity of water, sources of water, conveyance of water, quality of water and treatment of water, distribution system, appurtenance in distribution system, water supply plumbing in building, introduction to sanitary engineering, quantity of sewage, sewerage system, sewer appurtenance, sewage characteristics, sewage disposal, sewage treatment, sanitary plumbing for building and rural water supply sanitation.

(k) **Construction Management**

Introduction to construction management, construction planning, materials management, site management, construction organisation, labour management, equipment management, quality control, monitoring progress and safety management in construction works.

(l) **Advanced Construction Technology**

Concrete mixed design, handling and transporting of concrete, earthquake resistant construction, building services, construction and earth moving equipments.

**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 enclosed in the application. The scribe must have less qualification than the educational qualification prescribed for the post.

**11. Admission letter:**

Admission Letters for the written examination will be made available to the eligible candidates in the official website of the commission one week prior to the date of the examination carrying the photograph and signature of the eligible/qualified candidate and signature of the Secretary of the Commission. This will carry intimation about the date, time and venue of the written examination. Each eligible candidates shall have to download their admit card/admission letter well before the date of the examination by logging in to the official website of the Commission "[www.ossce.gov.in](http://www.ossce.gov.in)" and clicking at sub menu 'online application' by using their 'User ID' and 'Password'. Candidates may note that if the application has been rejected the same would be indicated along with grounds of rejection in the Commission's website for information of the candidates. The date(s)/Time/Venue of the examination will be notified in local dailies (newspapers) and in the Commission's website for information of the candidates.



Properties of Pure Substances, 1<sup>st</sup> Law of Thermodynamics, 2<sup>nd</sup> 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 steels.

## **Paper II**

### **Part-A : Civil & Structural Engineering**

#### **Civil Engineering**

**Building Materials** : Physical and Chemical properties, classification, standard tests, uses and manufacture/quarrying of materials e.g. building stones, silicate based materials, cement (Portland), asbestos products, timber and wood based products, laminates, bituminous materials, paints, varnishes.

**Estimating, Costing and Valuation**: estimate, glossary of technical terms, analysis of rates, methods and unit of measurement, Items of work – earthwork, Brick work (Modular & Traditional bricks), RCC work, Shuttering, Timber work, Painting, Flooring, Plastering. Boundary wall, Brick building, Water Tank, Septic tank, Bar bending schedule, Centre line method, Mid-section formula, Trapezoidal formula, Simpson's rule. Cost estimate of Septic tank, flexible pavements, Tube well, isolates and combined footings, Steel Truss, Piles and pile-caps. Valuation – Value and cost, scrap value, salvage value, assessed value, sinking fund, depreciation and obsolescence, methods of valuation.

**Surveying** : Principles of surveying, measurement of distance, chain surveying, working of prismatic compass, compass traversing, bearings, local attraction, plane table surveying, theodolite traversing, adjustment of theodolite, Levelling, Definition of terms used in levelling, contouring, curvature and refraction corrections, temporary and permanent adjustments of dumpy level, methods of contouring, uses of contour map, tachometric survey, curve setting, earth work calculation, advanced surveying equipment.

**Soil Mechanics** : Origin of soil, phase diagram, Definitions-void ratio, porosity, degree of saturation, water content, specific gravity of soil grains, unit weights, density index and interrelationship of different parameters, Grain size distribution curves and their uses. Index properties of soils, Atterberg's limits, ISI soil classification and plasticity chart. Permeability of soil, coefficient of permeability, determination of coefficient of permeability, Unconfined and confined aquifers, effective stress, quick sand, consolidation of soils, Principles of consolidation, degree of consolidation, pre-consolidation pressure, normally consolidated soil, e-log p curve, computation of ultimate settlement. Shear strength of soils, direct shear test, Vane shear test, Triaxial test. Soil compaction, Laboratory compaction test, Maximum dry density and optimum moisture content, earth pressure theories, active and passive earth pressures, Bearing capacity of soils, plate load test, standard penetration test.

**Hydraulics** : Fluid properties, hydrostatics, measurements of flow, Bernoulli's theorem and its application, flow through pipes, flow in open channels, weirs, flumes, spillways, pumps and turbines.

Irrigation Engineering: Definition, necessity, benefits, 2II effects of irrigation, types and methods of irrigation, Hydrology – Measurement of rainfall, run off coefficient, rain gauge, losses from precipitation – evaporation, infiltration, etc. Water requirement of crops, duty, delta and base period, Kharif and Rabi Crops, Command area, Time factor, Crop ratio, Overlap allowance, Irrigation efficiencies. Different type of canals, types of canal irrigation, loss of water in canals. Canal lining – types and advantages. Shallow and deep to wells, yield from a well. Weir and barrage, Failure of weirs and permeable foundation, Slit and Scour, Kennedy's theory of critical velocity. Lacey's theory of uniform flow. Definition of flood, causes and effects, methods of flood control, water logging, preventive measure. Land reclamation, Characteristics of affecting fertility of soils, purposes, methods, description of land and reclamation processes. Major irrigation projects in India.

Transportation Engineering: Highway Engineering – cross sectional elements, geometric design, types of pavements, pavement materials – aggregates and bitumen, different tests, Design of flexible and rigid pavements – Water Bound Macadam (WBM) and Wet Mix Macadam (WMM), Gravel Road, Bituminous construction, Rigid pavement joint, pavement maintenance, Highway drainage, Railway Engineering- Components of permanent way – sleepers, ballast, fixtures and fastening, track geometry, points and crossings, track junction, stations and yards. Traffic Engineering – Different traffic survey, speed-flow-density and their interrelationships, intersections and interchanges, traffic signals, traffic operation, traffic signs and markings, road safety.

Environmental Engineering: Quality of water, source of water supply, purification of water, distribution of water, need of sanitation, sewerage systems, circular sewer, oval sewer, sewer appurtenances, sewage treatments. Surface water drainage. Solid waste management – types, effects, engineered management system. Air pollution – pollutants, causes, effects, control. Noise pollution – cause, health effects, control.

### Structural Engineering

Theory of structures: Elasticity constants, types of beams – determinate and indeterminate, bending moment and shear force diagrams of simply supported, cantilever and over hanging beams. Moment of area and moment of inertia for rectangular & circular sections, bending moment and shear stress for tee, channel and compound sections, chimneys, dams and retaining walls, eccentric loads, slope deflection of simply supported and cantilever beams, critical load and columns, Torsion of circular section.

Concrete Technology: Properties, Advantages and uses of concrete, cement aggregates, importance of water quality, water cement ratio, workability, mix design, storage, batching, mixing, placement, compaction, finishing and curing of concrete, quality control of concrete, hot weather and cold weather concreting, repair and maintenance of concrete structures.

RCC Design: RCC beams-flexural strength, shear strength, bond strength, design of singly reinforced and double reinforced beams, cantilever beams. T-beams, lintels. One way and two way slabs, isolated footings. Reinforced brick works, columns, staircases, retaining wall, water tanks (RCC design questions may be based on both Limit State and Working Stress methods).

Steel Design: Steel design and construction of steel columns, beams roof trusses plate girders.

### Part-B (Electrical Engineering):

Basic concepts : Concepts of resistance, inductance, capacitance, and various factors affecting them. Concepts of current, voltage, power, energy and their units.

Circuit law : Kirchhoff's law, Simple Circuit solution using network theorems.

Magnetic Circuit : Concepts of flux, mmf, reluctance, Different kinds of magnetic materials, Magnetic calculations for conductors of different configuration e.g. straight, circular, solenoidal, etc. Electromagnetic induction, self and mutual induction.

AC Fundamentals: Instantaneous, peak, R.M.S. and average values of alternating waves, Representation of sinusoidal wave form, simple series and parallel AC Circuits consisting of R.L. and C, Resonance, Tank Circuit. Poly Phase system – star and delta connection, 3 phase power, DC and sinusoidal response of R-L and R-C circuit.

Measurement and measuring instruments: Measurement of power (1 phase and 3 phase, both active and re-active) and energy, 2 wattmeter method of 3 phase power measurement. Measurement of frequency and phase angle. Ammeter and voltmeter (both moving coil and moving iron type), extension of range wattmeter, Multimeters, Megger, Energy meter AC Bridges. Use of CRO, Signal Generator, CT, PT and their uses. Earth Fault detection.

Electrical Machines : (a) D.C. Machine – Construction, Basic Principles of D.C. motors and generators, their characteristics, speed control and starting of D.C. Motors. Method of braking motor, Losses and efficiency of D.C. Machines. (b) 1 phase and 3 phase transformers – Construction, Principles of operation, equivalent circuit, voltage regulation, O.C. and S.C. Tests, Losses and efficiency. Effect of voltage, frequency and wave form on losses. Parallel operation of 1 phase / 3 phase transformers. Auto transformers. (c) 3 phase induction motors, rotating magnetic field, principle of operation, equivalent circuit, torque-speed characteristics, starting and speed control of 3 phase induction motors. Methods of braking, effect of voltage and frequency variation on torque speed characteristics.

Fractional Kilowatt Motors and Single Phase Induction Motors: Characteristics and applications.

Synchronous Machines - Generation of 3-phase e.m.f. armature reaction, voltage regulation, parallel operation of two alternators, synchronizing, control of active and reactive power. Starting and applications of synchronous motors.

Generation, Transmission and Distribution – Different types of power stations, Load factor, diversity factor, demand factor, cost of generation, inter-connection of power stations. Power factor improvement, various types of tariffs, types of faults, short circuit current for symmetrical faults. Switchgears – rating of circuit breakers, Principles of arc extinction by oil and air, H.R.C. Fuses, Protection against earth leakage / over current, etc. Buchholz relay, Merz-Price system of protection of generators & transformers, protection of feeders and bus bars. Lightning arresters, various transmission and distribution system, comparison of conductor materials, efficiency of different system. Cable – Different type of cables, cable rating and derating factor.

Estimation and costing : Estimation of lighting scheme, electric installation of machines and relevant IE rules. Earthing practices and IE Rules.

Utilization of Electrical Energy : Illumination, Electric heating, Electric welding, Electroplating, Electric drives and motors.

Basic Electronics : Working of various electronic devices e.g. P N Junction diodes, Transistors (NPN and PNP type), BJT and JFET. Simple circuits using these devices.

**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 H<sub>2</sub>O, 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).

1<sup>st</sup> Law of Thermodynamics : Definition of stored energy & internal energy, 1<sup>st</sup> 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.

2<sup>nd</sup> 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 2<sup>nd</sup> 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 : Venturimeter, 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.