

**ANNEXURE-III****SCHEME AND SYLLABUS FOR THE POST OF ASSISTANT ENGINEER, MUNICIPAL ASSISTANT ENGINEER, TECHNICAL OFFICER AND JUNIOR TECHNICAL OFFICER IN VARIOUS ENGINEERING DEPARTMENTS****SCHEME OF EXAMINATION**

<b>WRITTEN EXAMINATION (Objective Type)</b>	<b>No. of Questions</b>	<b>Duration (Minutes)</b>	<b>Maximum Marks</b>
<b>Paper-I:</b> General Studies and General Abilities	150	150	150
<b>Paper-II:</b> Civil Engineering (Diploma Level) OR Mechanical Engineering (Diploma Level) OR Electrical and Electronics Engineering (Diploma Level)	150	150	150
<b>Total</b>			<b>300</b>

<b>NAME OF THE PAPERS</b>	<b>LANGUAGE OF EXAMINATION</b>
Paper-I: General Studies and General Abilities	Bilingual i.e., English and Telugu
Paper-II: Concerned Subject (Diploma Level)	English

**Syllabus****PAPER-I: GENERAL STUDIES AND GENERAL ABILITIES**

1. Current Affairs – Regional, National and International
2. International Relations and Events.
3. General Science; India's achievements in Science and Technology
4. Environmental issues and Disaster Management
5. Economy of India and Telangana
6. Geography of India with a focus on Telangana
7. Indian Constitution and Polity with a focus on local self Government
8. Society, Culture, Heritage, Arts and Literature of Telangana
9. Policies of Telangana State
10. History of Modern India with a focus on Indian National Movement
11. History of Telangana with special emphasis on Movement for Telangana Statehood
12. Logical Reasoning, Analytical Ability and Data Interpretation
13. Basic English (8<sup>th</sup> Class Standard)

## **PAPER-II: CIVIL ENGINEERING (DIPLOMA LEVEL)**

### **1. Surveying**

Fundamental concepts; Classification of Surveys; Chain Surveying; Compass Surveying; Levelling and Contouring; Theodolite Surveying; Tacheometry; Curves; Introduction and fundamental concepts of electronic measuring instruments - EDM, Total Station, GIS & GPS.

### **2. Construction Materials & Practice**

Properties and uses of construction materials - Stones, Bricks, Tiles, Sand, Cement, Timber, Plastics, Glass, Asbestos, Paints, Distempers, Enamels and Varnishes; Preparation of Cement mortar for various works.

Classification of Buildings as per NBC, Site investigation for foundation as per NBC - Trial Pit and auger boring, classification of foundations, construction of spread footing and well foundation; Stone and Brick masonry - types and principles of construction; Doors and Windows - types, fittings and fastenings, types and functions of Lintels, Sunshades and Roofs, Flooring - Construction and types of material; Types of Stairs; Scaffolding; Types of Plastering, Pointing, Painting and White / Colour Wash.

### **3. Engineering Mechanics and Strength of Materials**

Forces - types of Forces, Parallelogram, Triangle and Polygon Law of Forces, Lami's theorem; Centre of Gravity and Moment of Inertia; Simple stresses and strains, Hooke's law – stress strain diagram, working strength, elastic constants, Poisson's ratio, Relationship between elastic constants, compound rods, temperature stresses, strain energy, proof resilience, impact loading; Shear force and bending moment diagrams for simply supported, over hanging and cantilever beams, relation between intensity of loading, shear force and bending moment; Theory of simple bending, modulus of section, moment of resistance, distribution of shear stress in rectangular, circular and I-Sections; Deflection in cantilever and simply supported beams subjected to simple loading; Columns and struts - Euler's and Rankine's formulae, Slenderness ratio, simple built-up columns; Analysis of dams and retaining walls; Simple plane and pin-jointed trusses, Stresses by method of joints and method of sections.

### **4. Hydraulics**

Properties of fluids, fluid pressure and its measurement; Types of flows, energies in fluid motion, Bernoulli's theorem and its applications – venture metre, pitot tube; Orifice and mouthpiece; Notches and weirs; Flow through pipes, hydraulic gradient line and total energy line, laminar and turbulent flow in pipes - Reynolds number, measurement of velocity; open channels; Water turbines – classification, centrifugal and reciprocating pumps; Layout of hydroelectric power plant.

### **5. Quantity Surveying**

Abstract estimate, detailed estimate - centreline and long & short wall method, various items of Civil Engineering works as per Indian Standards; General Specifications - earth work, brick / stone masonry in cement mortar, RCC, plastering in cement mortar, Floor finishes with ceramic tiles and marbles, white washing, colour washing; Standard schedule of rates, lead and lift, preparation of lead statement; Computation of earth work - Mid-ordinate, Mean Sectional area, Trapezoidal method, Prismoidal Rule; Approximate estimate – Plinth area and cubic rate estimate.

### **6. Design of Structures (RCC and Steel)**

RCC structures: Design philosophies – principles and concepts of working stress method and limit state method, loads and permissible stresses, IS specifications, analysis and design - rectangular beam, slab, T-beam, column, footing and stair case.

Steel Structures: Properties of steel sections, loads and permissible stresses, IS specifications, Analysis and design - welded joints, beam, column, column base, tension member; Design of roof truss.

### **7. Irrigation Engineering**

Definitions, duty, delta, base period, rainfall and its measurement, factors affecting runoff, methods of computing maximum flood discharge; Classification of head works, component parts of a weir and barrage, factors influencing selection of site - reservoirs and dams; Classification of canals, canal lining, cross drainage works; Soil erosion, water logging, soil water plant relationship; Necessity of irrigation - advantages and disadvantages, irrigation methods.

## 8. Environmental Engineering

Basics of ecosystem, water supply scheme; Sources of water; Conveyance of water – pipes, joints and laying; Testing of water, drinking water standards; Treatment of water; Distribution of water; Water supply connection to a building.

Quantity of sewage, surface drains, design of sewers running half full, limiting velocities; Laying of sewers, sewer appurtenances; Collection of sewage samples, characteristics of domestic and industrial sewage – BOD, COD; Sewage treatment, septic tank & soak pit, sewage disposal - dilution and sewage farming; House drainage arrangements in buildings; Solid waste - collection and disposal; Air Pollution - sources, effects and controlling methods.

## 9. Transportation Engineering

Alignment of roads - plain and hilly terrain, surveys; Cross section of road structure, width of pavement, Camber, Gradient, Super elevation, Transition curves, horizontal and vertical alignment; Pavement marking, traffic signs, traffic islands.

Types of soil, classification of soil - Textural, IS Classification, physical properties - plasticity, cohesion, consolidation, compaction, permeability, compressibility, soil moisture content, specific gravity, density; Bearing capacity of soil.

### PAPER-II: MECHANICAL ENGINEERING (DIPLOMA LEVEL)

#### 1. Thermal Engineering:

**Thermodynamics:** Thermodynamic systems and properties – Zeroth law of thermodynamics - First law of thermodynamics – Second law of thermodynamics – Steady flow energy equation - Laws of perfect gases – Characteristics gas equation – Universal gas equation. Thermodynamic processes – Entropy – Air stand cycles – Carnot cycle – Otto cycle – Diesel cycle. Properties of steam - Sensible heat - Latent heat – Degree of super heat - Dryness fraction - Simple calculations on enthalpy of steam without using steam tables and Mollier chart. Refrigeration and Air conditioning – Fundamentals of refrigeration - Definition and meaning of refrigeration – Unit of refrigeration – COP – Carnot Refrigeration cycle and Bell column refrigeration cycle. Fuels – Types of fuels – Calorific values – Bomb calorimeter and Junker gas calorimeter.

**Heat Engines:** Internal Combustion Engines – Components of IC engines - Working principle – Valve and Port timing diagrams - Working of simple carburetor - Cooling system - Ignition system - Governing and Super charging of IC engines. Air compressors – Type of compressors – Single stage compressor – Multi stage Compressor - Rotary compressors. Gas turbines – Classification – Working of Constant Pressure (Open, closed and Semi closed) gas turbines - Applications and limitations of gas turbines. Steam Boilers – Classification – Working and differences between fire tube and water tube boilers - Mountings and Accessories – Performance of Boiler. Steam nozzles & Turbines – Flow through steam nozzles – Velocity and discharge through steam nozzles – Critical pressure ratio - Classification of turbines - Working principle of impulse and reaction turbines - Expression for Axial thrust, Tangential thrust, Work done and efficiencies – Methods of compounding – Governing of turbines.

**Automobile Engineering:** Identify of the various components of an Automobile - Functions of basic structure, power plant, transmission system, auxiliaries, Control of the Automobile - Concept of total resistance.

#### 2. Manufacturing Technology:

**Methods of manufacturing processes:** Foundry - Mechanical working of metals - Powder metallurgy - Welding, soldering and brazing - Lathe and Lathe work - Drilling machines – Shaper, Slotter and Planer – Broaching Machines - Milling and Grinding machines - Modern machining processes - USM, AJM, EDM and LBM Processes - Plastics and Plastic processing - Press tools - Jigs and Fixtures. **Metrology:** Linear and Angular measurements – Comparators - Measurement of surface roughness - Collimators - Interferometer.

### 3. Engineering Mechanics & Strength of Materials:

**Statics:** Scalar and Vector quantities - Force - System of forces – Composition and resolution of forces - Resultant of forces – Parallelogram law of forces – Moment of a force – Law of moments – Varignon's principle – Parallel forces and their resultant - Couples and moment of a couple - Equilibrium and equilibrant – Conditions for equilibrium - Triangle and Polygon law of forces - Lami's theorem. Friction - Simple machines - Centre of gravity - Moment of Inertia.

**Dynamics:** Linear Motion – Motion under gravity - Newton's laws of motions – Impulse - Law of Conservation of momentum and Recoil of gun – Work, Power and Energy – Circular motion – Centripetal force – Motion of a vehicle on level circular track – Super elevation - Simple Harmonic motion – Applications of SHM.

**Strength of Materials:** Simple stresses and strains – Stress and strain diagram - Hooke's law – Elastic constants - Poisson's ratio - Relationship between elastic constants - Temperature stresses - Strain energy - Shear force and bending moment diagrams – Type of beams - Types of loads - SF and BM diagrams with Point load and uniformly distributed loads for Cantilever and Simply supported beam - Theory of simple bending – Bending equation - Bending stress - Modulus of section – Deflection and slope of Cantilever and simple supported beam with Point load and uniformly distributed load - Torsion of shafts - Springs - Thin cylindrical shells.

### 4. Machine Design:

Design factors - Factor of safety - Limits, tolerances and fits – Conventional symbols of Materials and machine components - Welding symbols - Surface roughness values and symbols - Specifications of materials and standard components - Bolts, Nuts and screws - Shafts, keys and couplings - Belt, chain and Gear drives – Cams - Fly wheel – Governors.

### 5. Engineering Materials:

Mechanical properties of engineering materials - Testing and structure of materials - Production of iron and steel – Iron/carbon equilibrium diagram - Heat treatment of steels - Ferrous and non ferrous metals and their alloys.

### 6. Hydraulics and Hydraulics Machinery:

**Hydraulics:** Properties of fluids - Fluid pressure and its measurement - Types of fluid flow – Reynolds's Number – Equation of Continuity - Energy of fluids - Bernoulli's theorem – Venturimeter - Pitot tube – Hydraulic Co-efficients. *Flow through pipes:* Concept of loss of head in pipes due to friction - Darcy's and Chezy's formulae - Hydraulic gradient line and total energy line - Power transmission through a pipe – Syphon – Transmission efficiency - Condition for max. power transmission through a pipe.

**Hydraulics Machines:** Impact of jets - *Water turbines:* Classification of turbines - Pelton wheel - Francis turbine - Kaplan turbine – Expressions for Work, Power, and Efficiencies of Pelton wheel, Francis Turbine and Kaplan Turbine - Differences between turbines - Governing of turbines. - Hydro electric power plant and its Lay out. *Pumps:* Classification of pumps - Construction and working of Reciprocating single acting/double acting pumps – Expressions for discharge, slip, Work and Power – Air vessel. *Centrifugal pumps:* Construction and working of Centrifugal pumps - Expression for Work, Power, Manometric head and Efficiencies – Differences between Pumps – Priming - Foot Valve and strainer – Cavitation.

### 7. Industrial Engineering and Management:

**Management:** Principles and functions of management - Organization structure and organizational behavior – Production Management - Material management - Marketing and sales.

**Industrial Engineering:** Work study - Wages and incentives - Fundamentals of estimation – Depreciation - Elements of Costing.

## PAPER-II: ELECTRICAL AND ELECTRONICS ENGINEERING (Diploma Level)

### 1. BASIC ELECTRICAL ENGINEERING & BATTERIES

Basics of Electrical Engineering – Ohms law – Laws of resistance – Resistances in series & parallel – Work, Power, Energy – Heating effects of Electric current – Magnetic Effects of Electric current – Electromagnetic induction – Electrostatics – conducting, Insulating, Semiconductor materials – Special purpose materials – Basics of Batteries – construction, working principle, Efficiencies, charging methods, Applications of batteries.

### 2. ELECTRICAL CIRCUITS

D.C.Circuits, Network Theorems with reference to D.C., A.C. Circuits and fundamentals of A.C – Series circuits, Parallel circuits, resonance Q-factor, Polyphase circuits, Relation between phase value and line value in star and delta circuits, measurement of 3-phase Power with 2-watt meter method.

### 3. DC MACHINES

Basics of D.C.Generators – Theory, Construction, working, Classification, EMF Equation, Losses & Efficiency, Armature Reaction, Commutation, Characteristics, Parallel operation & Applications of D.C Generators – Basics of D.C Motors – Theory, Construction, Working, Classification, Back EMF, Torque, Characteristics, Applications, Speed control of DC Motors – Starters for D.C Motors – Testing of DC Motors.

### 4. MEASURING INSTRUMENTS

Basic of measuring instruments – Theory, Construction, Working, Errors, Advantages, Disadvantages & Applications, of M.C, M.I, Dynamometer & Induction meters, single phase and three phase Energy Meters, PF Meter, Weston frequency meter, Weston Synchroscope, Trivector meter. Measurement of resistance – Potentiometers – Various types of Transducers and Sensors – Various types Electronic & digital measuring instruments.

### 5. AC MACHINES

Transformers: Principle, construction working, classifications, EMF Equations, theory of transformers, Equivalent circuit, regulation, losses, efficiency, All-day efficiency testing – Auto transformer – 3-phase transformers – Instrument transformers – parallel operation; Alternator – Principle, construction, working, EMF Equation, Armature reaction, voltage regulations, testing parallel operation, load sharing; 3-phase Synchronous Motors – Construction, working, effect of excitation, V curve, inverted V curve, hunting, methods of starting, Speed variation methods, applications; 3-phase induction Motor-construction, working, types, Slip, torque, torque-slip curves, Equivalent circuit, power stages, testing, circle diagrams, starters, speed control and applications; 1-phase Induction Motors – Construction, Principle of working and applications of split phase, capacitors start, capacitors start & run, shaded pole, Commutator motors – Construction working, speed control and applications of A.C Series motor, universal motor, stepper motors, permanent magnet brushless motors.

### 6. ELECTRONICS ENGINEERING

Basic semiconductor devices and their characteristics – power supplies – amplifiers – oscillators – CRO – IC Timers – special devices; Number systems – Basic logic gates – Boolean algebra – adders – subtractors – A/D, D/A converters – Flip Flops – Registers – counters & memories; Architecture of 8051 micro controller – instruction set – programming concepts.

### 7. POWER SYSTEMS

Conventional & Non Conventional Energy sources. Construction, working, maintenance & suitability of thermal, hydro and nuclear power stations – Energy auditing – Gas power station - principle & working, combined operation & Economics of power stations; Switch Gear – Theory of electric arc and its quenching – circuit breakers – reactors and short circuit KVA calculations. Relays – over current, directional, impedance and distance relays; Protection of alternators & transformers. Transmission lines – short, medium transmission lines and various calculations- Regulation, charging currents – Ferranti effect, corona – hot line techniques; HVDC Transmission- Basic components and advantages; Line Structures – Sag calculations- insulators – string voltage, efficiency and guarding; Substations-Classification-equipment, layout and earthing of 132/11KV&33/11 KV substations; Distribution System: Feeders-distributors – service mains-voltage drop calculations. Protection of transmission lines and feeder – lightning arresters-neutral grounding.

8. ELECTRICAL INSTALLATION & ESTIMATION  
Estimation of lighting & power loads – OH Lines & Earthing, departmental tests, REC & Electrical act-2013, Maintenance of electrical machines.
9. UTILISATION & TRACTION  
Principle of lighting – types of lamps – construction & Working – laws of illumination – illumination calculation. Heating, Welding; Electric drives – Load curves – motors for different applications; Electric braking for D.C& A.C motors. Electric traction – Speed time curves – Co-efficient of adhesion – over head equipment – supply system.
10. POWER ELECTRONICS  
Basics of power electronic devices - Construction, Working, theory, Characteristic, Advantages, Disadvantages, Applications & mechanism of protection of SCR, TRIAC, DIAC, GTO, UJT, IGBT, converters, inverters, AC regulators, Choppers, Cycloconverters – Speed control of AC& DC Motors using Power electronic devices – Applications of power electronic devices.