SCHEME AND SYLLABUS FOR RECRUITMENT TO THE POSTS OF ASSISTANT EXECUTIVE ENGINEERS (MECHANICAL) IN IRRIGATION AND CAD DEPARTMENT

SCHEME OF EXAMINATION

	No. of Questions	Duration (Minutes)	Maximum Marks
PART: A: WRITTEN EXAMINATION (OBJECTIVE TYPE) **Paper-I**: General Studies and General Abilities	150	150	150
Paper-II: Mechanical Engineering (Degree Level)	150	150	300
PART: B: INTERVIEW			50
		Total	**500**

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; Disaster Management- Prevention and Mitigation Strategies.
5. Economic and Social Development of India and Telangana.
6. Physical, Social and Economic Geography of India.
7. Physical, Social and Economic Geography and Demography of Telangana.
8. Socio-economic, Political and Cultural History of Modern India with special emphasis on Indian National Movement.
9. Socio-economic, Political and Cultural History of Telangana with special emphasis on Telangana Statehood Movement and formation of Telangana state.
10. Indian Constitution; Indian Political System; Governance and Public Policy.
11. Social Exclusion; Rights issues such as Gender, Caste, Tribe, Disability etc. and inclusive policies.
12. Society, Culture, Heritage, Arts and Literature of Telangana.
13. Policies of Telangana State.
14. Logical Reasoning; Analytical Ability and Data Interpretation.
15. Basic English. (10th class Standard)

PAPER-II: MECHANICAL ENGINEERING (DEGREE LEVEL)

Section I: Applied Mechanics and Design

1. **Engineering Mechanics:** Free-body diagrams and equilibrium; trusses and frames; virtual work; kinematics and dynamics of particles and of rigid bodies in plane motion; impulse and momentum (linear and angular) and energy formulations, collisions.

2. **Mechanics of Materials:** Stress and strain, elastic constants, Poisson's ratio; Mohr's circle for plane stress and plane strain; thin cylinders; shear force and bending moment diagrams; bending and shear stresses; deflection of beams; torsion of circular shafts; Euler's theory of columns; energy methods; thermal stresses; strain gauges and rosettes; testing of materials with universal testing machine; testing of hardness and impact strength.

3. **Theory of Machines:** Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of linkages; cams; gears and gear trains; flywheels and governors; balancing of reciprocating and rotating masses; gyroscope.

4. **Vibrations:** Free and forced vibration of single degree of freedom systems, effect of damping; vibration isolation; resonance; critical speeds of shafts.

5. **Machine Design:** Design for static and dynamic loading; failure theories; fatigue strength and the S-N diagram; principles of the design of machine elements such as bolted, riveted and welded joints, keys, shafts, gears, rolling and sliding contact bearings, brakes and clutches, springs.

Section II: Fluid Mechanics and Thermal Sciences

1. **Fluid Mechanics:** Fluid properties; fluid statics, manometry, buoyancy, forces on submerged bodies, stability of floating bodies; control-volume analysis of mass, momentum and energy; fluid acceleration; differential equations of continuity and momentum; Bernoulli's equation; dimensional

   analysis; viscous flow of incompressible fluids, boundary layer, elementary turbulent flow, flow through pipes, head losses in pipes, bends and fittings.

2. **Heat-Transfer:** Modes of heat transfer; one dimensional heat conduction, resistance concept and electrical analogy, heat transfer through fins; unsteady heat conduction, lumped parameter system, thermal boundary layer, dimensionless parameters in free and forced convective heat transfer, heat transfer correlations for flow over flat plates and through pipes, effect of turbulence; heat exchanger performance, LMTD and NTU methods; radiative heat transfer, Stefan- Boltzmann law, Wien's displacement law, black and grey surfaces, view factors, radiation network analysis.

3. **Thermodynamics:** Thermodynamic systems and processes; properties of pure substances, behavior of ideal and real gases; zeroth and first laws of thermodynamics, calculation of work and heat in various processes; second law of thermodynamics; availability and irreversibility; thermodynamic relations.

4. **Power Engineering**: Air compressors; vapour and gas power cycles, concepts of regeneration and reheat.

5. **I.C. Engines**: Air-standard Otto, Diesel and dual cycles.

6. **Refrigeration and air-conditioning:** Vapour and gas refrigeration and heat pump cycles; basic psychrometric processes.

7. **Turbomachinery:** Impulse and reaction principles, velocity diagrams, Pelton-wheel, Francis and Kaplan turbines.

Section III: Materials, Manufacturing and Industrial Engineering

1. **Engineering Materials**: Structure and properties of engineering materials, phase diagrams, heat treatment, stress-strain diagrams for engineering materials.

2. **Casting, Forming and Joining Processes:** Different types of castings, design of patterns, moulds and cores; solidification and cooling; riser and gating design. Plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk metal forming processes such as forging, rolling, extrusion, drawing; and sheet metal forming processes such as shearing, deep drawing, bending; principles of powder metallurgy. Principles of welding, brazing, soldering and adhesive bonding.

3. **Machining and Machine Tool Operations:** Mechanics of machining; basic machine tools; single and multi-point cutting tools, tool geometry and materials, tool life and wear; economics of machining; principles of non-traditional machining processes; principles of work holding, design of jigs and fixtures.

4. **Metrology and Inspection:** Limits, fits and tolerances; linear and angular measurements; comparators; gauge design; interferometry; form and surface finish measurement; machine tool; alignment and testing methods; tolerance analysis in manufacturing and assembly.

5. **Computer Integrated Manufacturing:** Basic concepts of CAD/CAM and their integration tools.

6. **Production Planning and Control:** Forecasting models, aggregate production planning, scheduling, materials requirement planning.

7. **Inventory Control:** Deterministic models; safety stock inventory control systems.

8. **Operations Research:** Linear programming, simplex method transportation, assignment, network flow models, simple queuing models, PERT and CPM.