

**Syllabus for Urban Engineering/
Assistant Engineering Screening Test
(objective type)**

Time Allowed : 02 Hours

Total Questions : 100

Maximum Marks: 100

PART 'A'

Number of Questions: 25

Marks : 25

a) Theory of Structures: Principles of super-position; reciprocal theorem, unsymmetrical bending. Determinate and indeterminate Structure; simple and space frames; degrees of freedom; virtual work; energy theorem; deflection of trusses; redundant frames, three-moment equation; slope deflection and moment distribution methods; column analogy; Energy methods; approximate and numerical methods. Moving loads shearing force and Bending moment diagrams; influence lines for simple and continuous beams. Analysis of determinate and indeterminate arches. matrix methods of analysis, stiffness and flexibility matrices.

b) Steel Design: Factors of safety and load factor; Design of tension; compression and flexural members; built up beams and plate girders, semi-rigid and rigid connections, Design of stanchions, slab and gusseted bases; cranes and gantry grider; roof trusses; industrial and multi storeyed buildings. Plastic design of frames and portals.

c) R.C. Design: Design of slabs, simple and continuous beams, columns, footing-single and combined, raft foundations, elevated water tanks, encased beams and column, ultimate load design. Methods and systems of prestressing; anchorages, losses in prestress.

PART-B

Number of Questions: 25

Marks : 25

Sub - Part : a & b

Number of Questions: 10

Marks : 10

a) Fluid Mechanics: Dynamics of fluid flow-equations of continuity; energy and momentum. Bernoulli's theorem; caritation, velocity potential and stream function; rotational and irrotational flow, free and forced vortices; flow net, dimensional analysis and its application to practical problems. Viscous flow-flow between Static and moving parallel plates, flow through circular tubes; film lubrication. Velocity distribution in laminar and turbulent flow boundary layer, Incompressible flow through pipes laminar and turbulent flow critical velocity,

losses Stampton and moody's diagram. hydraulic and energy grade lines; siphons; pipe network. Forces on pipe bends. compressible flow-Adiabatic and isentropic flow, subsonic and supersonic velocity; mach number, shock wave, Water Hammer, surge Tanks.

b) Hydraulic Engineering: Open channel flow-Uniform and non-uniform flow, best hydraulic cross section. Specific enegy and critical depth, gradually varied flow; classification of surface profiles; control sections; standing wave flume; Surges and waves. Hydraulic jump.

Design of canals- Unlined channels in alluvium; the critical tractive stress, principles of sediment transport regime theories, lined channels; hydraulic design and coat analysis; drainage behind lining.

Canal structures- Designs of regulation work; cross drainage and communication workscross regulations, head regulator, canal falls, aqueducts, metering flumes etc., Canal outlets.

Diversion Headworks- Principles of design of different part on impermeable and permeable foundations; Khosla's theory; Energy dissipation; sediment exclusion.

Dams- Design of rigid dams; earth dams; Forces acting on dams: stability analysis.

Design of spillways.

Wells and Tube Wells.

Sub - Part : c

Number of Questions: 15

Marks : 15

c) Soil Mechanics and Foundation Engineering: Soil Mechanics- Origin and Classification of soils; Atterburg limits. Void ratio : moisture contents permeability, laboratory and field tests, seepage and flow nets, flow under hydraulic structures uplic and quick and condition. Unconfined and direct shear tests; triaxial test; heat pressure theories, stability of slopes; Theories of soil consolidation; rate of sttlement. Total and effective stress analysis, pressure distribution in soils; Boussinesque and Westerguard theories. Soil exploration. Foundation Engineering; Bearing capacity of footings; piles and walls; design of retaining walls; sheet piles and caissons. Principles of design of block foundation for machines.

PART 'C'

Number of Questions: 25

Marks : 25

a) **Building construction:** Building materials and constructions- timber, stone, brick, sand, surkhi, mortar, concrete, paints and varnishes, plastics, etc, Detailing of walls, floors roofs, ceilings, staircases, doors and windows. finishing of building plastering, pointing, painting etc. Use of building codes. Ventilation, air conditioning lighting and acoustics. Building estimates and specifications. Construction scheduling: PERT and CPM methods.

b) **RAILWAYS AND HIGHWAYS ENGINEERING:** Railways-Permanent way ballast sleeper; chairs and fastenings; points and crossings different types of turn outs cross over setting out of points. maintenance of track super elevation creep of rail, ruling gradients; track resistance, tractive effort; curve resistance, Station yards, station buildings; platform sidings; turn tables. Signals and interlocking; level crossings.

Roads and Runways- Classification of roads, planning geometric design. Design of flexible and rigid pavements; sub-bases and wearing surfaces. Traffic engineering and traffic surveys; intersections road signs; signal and markings.

Surveying: Plane Table Surveying: Equipment & methods, solution of 3 & 2 point problems. Errors and precaution. Triangulation; Grades, Baseline and its measurement, Satellite station, Intervisibility of Stations; Errors and Least squares. General methods of least squares estimation with interdisciplinary approach, adjustment of level nets and triangulation nets. Matrix notation solutions. Layout of curves: Simple, compound, reverse, transition and vertical curves. Project surveys and layout of Civil Engineering works such as buildings bridges, tunnels, and hydroelectric projects.

PART 'D'

Number of Questions: 25

Marks : 25

Sub - Part : a , b & c

Number of Questions: 10

Marks : 10

a) **Water Resources Engineering:** Hydrology- Hydrologic cycle; precipitation; evaporation-transpiration and infiltration hydrographs, unit hydrograph; Flood estimations and frequency. Planning for water Resources- Ground and Surface water resources; surface flows. Single and multipurpose projects storage capacity, reservoir losses, reservoir silting, flood routing. Benefit cost ratio. General principles of optimisation.

b) Water Requirements for crops- quality of irrigation water, consumptive use of water, water depth and frequency of irrigation; duty of water; Irrigation methods and efficiencies.

c) Distribution system for canal irrigation :- Determination of required channel capacity; channel losses, Alignment of main and distributary channels water logging its causes to control design of drainage system; soil salinity. river training- Principles and methods, Storage works-Types of dams (including earth dams.), and their characteristics, principles of design, criteria for stability. Foundation treatment; joints and galleries. Control of seepage. Spillways different types and their suitability, energy dissipation. Spillway crest gates.

Sub - Part : d , e & f

Number of Questions: 15

Marks : 15

d) Sanitation and Water Supply: Sanitation-Site and orientation of buildings; ventilation and damp proof course; house drainage; conservancy and waterborne system of waste disposal, sanitary appliances, latrines and urinals.

e) Environmental Engineering: Elementary principles of Ecology and Ecosystems and their interaction with environment. Engineering activity and Environmental pollution. Environment and its effects on human health and activity. Air Environment: Major pollutants and their adverse effects, types of air cleaning devices. Water quality: Parameters, adverse effects, monitoring salt purification of streams. Solid Wastes: Collection systems and disposal methods, their selection and operation. Typical features of Water distribution systems: Demand, available need, network analysis, storage, corrosion.

f) Typical features of Sewerage systems: Permissible velocities, partial flow in circular sewers, non-circular sections, corrosion in sewers, construction and maintenance, sewer upputrenances, Dumping of sewage, Plumbing: Standards & systems. Environmental Management.