

Paper-1

(A) Theory and Design of Structures:

(a) Theory-Principle of superposition, reciprocal theorem, unsymmetrical bending.

Determinate and indeterminate structures, simple and space frames, degrees of freedom, virtual works, energy theorems, deflection of trusses, redundant frames, three moments equation, slope of 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 and frames.

Analysis of determinate and indeterminate arches, spandrel braced arch.

Matrix methods of analysis, stiffness and flexibility matrix. Elements of plastic analysis.

(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 basis, crane and gantry girders, roof trusses, industrial and multi-storeyed buildings, water tanks.

Plastic design of continuous frames and portals.

(c) R.C.Design.--Design of slabs, simple and continuous beams, column, footing-single and combined raft foundations elevated water tanks, encased beams and columns ultimate load design.

Methods and systems of prestressing, Anchorages. Losses in prestress, design of prestressed girders, ultimate load design.

(B) Fluid Mechanics and Hydraulic Engineering:

Dynamics of fluid flow- equations of continuity energy and momentum. Bernoulli's theorem, Cavitation, 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 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, Stanton 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 waves, water hammer.

Open channel flow, uniform and non-uniform flow, beat hydraulic cross-section specific energy and critical depth gradually varried flow, classification of surface profiles control sections, standing wave flames, surges and Waves, Hydraulic jump.

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

Canalstructures- Designes of regulation work, cross drainage and communication work- cross regulators head regulators, canal falls, aqueducts, mattering flumes etc. canal outlets.

Diversion Headwork principles of design of different parts on impermeable and permeable foundations, Khosla's theory energy dissipation, sediment exclusion.

Dams- design of rigid dams, earth oams, forces acting on dams stability analysis.

Design of spillways.

Wells and Tubewells.

(c) Soil Mechanics and Foundation Engineering

Soil Mechanics- Original classification of soil, atterburg limits, voldratio, moisture contents, permeability, Laboratory and field tests, see page and flow nets flow under hydraulic structures uplift and quick sand condition. Unconfined and direct shear tests triaxial, test earth pressure theories, stability of slopes. Theories of and consolidation rate of settlement. Total effective stress analysis presssure distribution in soil, boussinasque soil waster guard theories, Soil, stabilization.

Foundation Engineering-Bearing capacity of footings, piles and wells design of rataining walls, sheet piles and caissons.

PAPER-II

Note-A candidate shall answer question only from any two part.

PART-A BUILDING CONSTRUCTIONS.

Building materials and construction-timber stone, brick, sand, surkhi, mortar Concrete, paints and varnishes, plastics, etc.

Detailing of walls, floors, roofs and ceilings, staircases, doors and windows, finishing of buildings, plastering jointing, painting etc., use of building codes ventilation, air-conditioning, lighting and accoustics.

Building estimates and specifications, construction scheduling -PERT and CPM methods.

PART-B RAILWAYS AND HIGHWAYS ENGINEERING

(a) Railways-Permanent way, ballast, sleeper, chairs and fastening, points and crossing different types of turn-outs, cross- overs, setting out of points.

Maintenance of track, super elevation, creep of rain, ruling gradients,track resistance, tractive effort, curve resistance.

Station yards and machinery, station building, platform sidings, turn tables.

Signals and inter locking, level crossing.

(b) Roads and Railways-Classification of roads, planning geometric design of flexible and rigid pavements sub-bases and wearing surfaces. Traffic engineering and traffic surveys, inter-sections and road signs, signals and markings.

PART-C WATER RESOURCES ENGINEERING

Hydrology--Hydrologic cycle, precipitation, evaporation, transpiration and infiltration hydrographs units hydrograph flood estimation and frequency.

Planning for Water Resources--Ground and surface water resources, surface flow, single and multipurpose projects, storage capacity, reservoir losses, reservoir silting, flood routing, benefit cost ratio. General principles of optimisation.

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.

Distribution system for canal irrigation-Determination of required channel capacity, channel losses, alignment of main and distributory channels.

Water logging-Its causes and 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 or seepage. Spillways-Different types and their suitability, energy dissipation, Spillway crest-gates.

PART-D SANITATION AND WATER SUPPLY

Sanitation:- Site and orientation of building , ventilation and damp proof course, house drainage, conservancy and water borne system of waste disposal. Sanitary appliances, latrines and urinals.

Disposal of sanitary sewage, Industrial waste, storm sewage separate and combined system. Flow through sewers, design of sewers, sewer appurtenances-Manholes, inlets, junctions, syphon, ejection etc., Sewer treatment working principles, units, chambers, sedimentation tank etc. Activated sludge process, septic tank, disposal of sludge. Rural sanitation, Environment pollution and ecology.

Water Supply:-Estimation of water resources, ground water hydraulics, predicting demand of water, impurities of water, physical, chemical and bacteriological analysis, water borne diseases. Intake of water-Pumping and gravity schemes. Water Treatment --Principles of settling, coagulation, flocculation and sedimentation. Slow, rapid and pressure filters, softening, removal of taste, odour and salinity.

Water Distribution:- Layouts, storage, hydraulic pipelines, pipe fittings, pumping stations and their operations.