

Broad outline of Paper-I General Ability Test

(i) **Basic Engineering Aptitude (Broad Outline)**

1. Basic Electrical Engineering.
2. Basic Civil Engineering (Building Material)
3. General Drg., Building Drg. & M/C Drg.
4. Basic Electronics.
5. Applied thermodynamics.
6. Principles of Management.
7. Introduction to strength of Material/Mechanics of material.
8. Engineering Mechanics (Static & dynamics)
9. Computer Fundamentals.

(ii) **General English**. The question paper in General English will be designed to test the candidate's understanding of English and workmanlike use of words.

(iii) **General Studies** : The paper in General Studies will include knowledge of current events and of such matters as of everyday observation and experience in their scientific aspects as may be expected of an educated person. The paper will also include questions on History of India and Geography of a nature which the candidates should be able to answer without special study.

Syllabus

Paper-II (Civil Engineering) (Part – A)

1. BUILDING MATERIALS

Timber : Different types and species of structural timber, density-moisture relationship, strength in different directions, defects, influence of defects on permissible stress, preservation, dry and wet rots, codal provisions for design, Plywood.

Bricks : Types, Indian Standard classification, absorption, saturation factor, strength in masonry, influence of mortar strength on masonry strength.

Cement : Components, different types, setting times, strength.

Concrete : Importance of W/C Ratio, Strength, ingredients including admixtures, workability, testing for strength, elasticity, non-destructive testing, mix design methods.

2. SOLID MECHANICS

Elastic constants, stress, plane stress, Mohr's circle of stress, strains, plane strain, Mohr's circle of strain, combined stress; Elastic theories of failure; Simple bending, shear; Torsion of circular and rectangular sections and simple members.

3. STRUCTURAL ANALYSIS

Analysis of determinate structures – different methods including graphical methods.

Analysis of indeterminate skeletal frames - moment distribution, slope-deflection, stiffness and force methods, energy methods, Muller-Breslau principle and application.

Plastic analysis of indeterminate beams and simple frames – shape factors.

4. DESIGN OF STEEL STRUCTURES

Principles of working stress method. Design of connections, simple members, Built-up sections and frames, Design of Industrial roofs. Principles of ultimate load design. Design of simple members and frames.

5. DESIGN OF CONCRETE AND MASONRY STRUCTURES

Limit state design for bending, shear, axial compression and combined forces. Codal provisions for slabs, beams, walls and footings. Design of R.C. members.

Principles of prestressed concrete design, materials, methods of prestressing, losses. Design of simple members and determinate structures. Introduction to prestressing of indeterminate structures.

6. CONSTRUCTION PRACTICE, PLANNING AND MANAGEMENT

Concreting Equipment :

Weight Batcher, Mixer, vibrator, batching plant, concrete pump.

Cranes, hoists, lifting equipment.

Earthwork Equipment :

Power shovel, hoe, dozer, dumper, trailers and tractor, rollers, sheep foot rollers, pumps.

Construction, Planning and Management :

Bar chart, linked bar chart, work-break down structures, Activity – on – arrow diagrams.
Critical path, probabilistic activity durations; Event-based networks.

PERT network : Time-cost study, crashing; Resource allocation.

Paper-II (Civil Engineering) (Part-B)

1. (a) FLUID MECHANICS, OPEN CHANNEL FLOW, PIPE FLOW :

Fluid Properties, Pressure, Thrust, Buoyancy; Flow Kinematics; Integration of flow equations; Flow measurement; Relative motion; Moment of momentum; Viscosity, Boundary layer and Control, Drag, Lift; dimensional Analysis, Modeling; Cavitation; Flow oscillations; Momentum and Energy principles in Open channel flow, Flow controls, Hydraulic jump, Flow sections and properties; Normal flow, Gradually varied flow; Surges; Flow development and losses in pipes, flows, measurements; Siphons; Surges and Water hammer; Delivery of power through pipes, Pipe networks.

(b) HYDRAULIC MACHINES AND HYDROPOWER :

Centrifugal pumps, types, performance parameters, scaling, pumps in parallel; Reciprocating pumps, air vessels, performance parameters; Hydraulic ram; Hydraulic turbines, types, performance parameters, controls, choice; Power house, classification and layout, storage, pondage, control of supply.

2. (a) HYDROLOGY :

Hydrological cycle, precipitation and related data analyses, PMP, unit and synthetic hydrographs; Evaporation and transpiration; Floods and their management, PMF; Streams gauging; River morphology; Routing of floods; Capacity of Reservoirs.

(b) WATER RESOURCES ENGINEERING :

Water resources of the globe: Multipurpose uses of Water: Soil-Plant-Water relationships, irrigation systems, water demand assessment; Storages and their yields, ground water yield and well hydraulics; Waterlogging, drainage design; Irrigation revenue; Design of rigid boundary canals, Lacey's and Tractive force concepts in canal design, lining of canals; Sediment transport in canals; Non-Overflow and overflow sections of gravity dams and their design, Energy dissipators and tailwater rating curves, Design of headworks, distribution works, falls, cross-drainage works, outlets; River training.

ENVIRONMENTAL ENGINEERING

3. (a) WATER SUPPLY ENGINEERING :

Sources of water supply, yields, design of intakes and conductors; Estimation of demand; Water quality standards; Control of Water-borne diseases; water treatment, detailing and maintenance of treatment units; Conveyance and distribution systems of treated water, leakages and control; Rural water supply; Institutional and industrial water supply.

(b) WASTE WATER ENGINEERING :

Urban rain water disposal; Systems of sewage collection and disposal; Design of sewers and sewerage systems; pumping; Characteristics of sewage and its treatment, Disposal of products of sewage treatment, streamflow rejuvenation Institutional and industrial sewage management; Plumbing Systems; Rural and semi-urban sanitation.

(c) SOLID WASTE MANAGEMENT :

Sources, classification, collection and disposal; Design and Management of landfills.

(d) AIR AND NOISE POLLUTION AND ECOLOGY :

Sources and effects of air pollution, monitoring of air pollution; Noise pollution and standards; Ecological chain and balance, Environmental impact assessment.

4. (a) SOIL MECHANICS :

Properties of soils, classification and interrelationship; Compaction behaviour, methods of compaction and their choice; Permeability and seepage, flow nets, Inverted filters; Compressibility and consolidation; Shearing resistance, stresses and failure; soil testing in laboratory and in-situ; Stress path and applications; Earth pressure theories, stress distribution in soil; soil exploration, samplers, load tests, penetration tests.

(b) FOUNDATION ENGINEERING :

Types of foundations, Selection criteria, bearing capacity, settlement, laboratory and field tests; Types of piles and their design and layout, Foundations on expansive soils, swelling and its prevention, foundation on swelling soils.

5. (a) SURVEYING :

Classification of surveys, scales, accuracy; Measurement of distances – direct and indirect methods; optical and electronic devices; Measurement of directions, prismatic compass, local attraction; Theodolites – types; Measurement of elevations – Spirit and trigonometric leveling; Relief representation; Contours; Digital elevation modeling concept; Establishment of control by triangulations and traversing – measurements and adjustment of observations, computation of coordinates; Field astronomy, Concept of global positioning system; Map preparation by plane tabling and by photogrammetry; Remote sensing concepts, map substitutes.

(b) TRANSPORTATION ENGINEERING :

Planning of highway systems, alignment and geometric design, horizontal and vertical curves, grade separation; Materials and construction methods for different surfaces and maintenance : Principles of pavement design; Drainage.

Traffic surveys, Intersections, signaling: Mass transit systems, accessibility, networking.

Tunnelling, alignment, methods of construction, disposal of muck, drainage, lighting and ventilation, traffic control, emergency management.

Planning of railway systems, terminology and designs relating to gauge, track, controls, transits, rolling stock, tractive power and track modernization; Maintenance; Appurtenant works; Containerisation.

Harbours – layouts, shipping lanes, anchoring, location identification; Littoral transport with erosion and deposition; sounding methods; Dry and Wet docks, components and operational Tidal data and analyses.

Airports – layout and orientation; Runway and taxiway design and drainage management; Zoning laws; Visual aids and air traffic control; Helipads, hangers, service equipments.

.....