Syllabus For Common Educational Services Examination

CIVIL ENGINEERING (DEGREE)

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 mansory strength.

Cement: Compound of different types, setting times, strength.

Cement Mortar: Ingredients, proportions, water demand, mortars for plastering and masonry.

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

2. SOLID MECHANICS: Elastic constans, 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 indeterminate skeletal frames-moment distribution, slope-deflection, stiffness and force methods, energy methods, Muller-Bresiau principle and application. Plastic analysis of indeterminate beams and simple-shape factors.

4. DESIGN OF STEEL STRUCTURES: Principles of working stress method.

Design of connections, simple members, Bilt-up sections and frames. Design of Industrial roofs, principle of cultimate load design. Design of simple member and frames.

5. DESIGN OF CONCRETE AND MASONRY STRUCTURES: Limit state design for bending, shear, axial compression and combined forces. Codel provisions foe slabs, beams, walls and footings. Working stress method of design of R.C. members. Principles of prestresses concrete design, materials, method of prestressing, losses. Design of simple members and determinate structures. Introductions to prestressing of indeterminate structures.

Design of brick mansory as per I.S. Codes.

6. CONSTRUCTION PRACTICE, PLANNING AND MANAGEMENT:

Concreting Equipment: Weight, batcher, mixer, vibrator, batching plant, concrete pump, granes, hoists, lifting equipment.

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

Construction, Planning and Management: Bar chart, link bar chart, work-break down structures, activity on-arrow diagrams. Critical path, probabilistic activity durations; Event-based networks. PERT network; time-cost study, crashing; Resources allocation

7. ***(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; dimentional analysis, modelling, cavitation; flow oscillations; momentum and energy principles in open channel flow, flow controls, hydraulic jump, flow sections and properties; normal flow, gradually varies flow, surges; flow development and losses in pipe flows; measurements; siphons; surges and water hammer; delivery of power; pipe network.

(b) HYDRAULIC MACHINES AND HYDROPOWER: Centrifugal pumps, types, performance parameters, scaling, pumps in paraller, reciprocating pumps, air vessels, performance parameters; hydraulic ram; hydraulic turbines, types, performance parameters, controls, choice; power houses, classification and payout, storage, pondage, control of supply.

8. ***(a) HYDROLOGY:*** Hydrological cycle, precipitation and related data analysis, PMP, unit and synthetic hydrographs; evaporation and transpiration; floods and their management, PMF: streams and their gauging; river morphology; routing of floods; capacity of reservoirs.

(b) WATER RESOURCES ENGINEERING: Water resources of the glone; multipurpose uses of water; soil-plant-water relationship, irrigation systems, water demand assessment; storages and their yields, ground water yields 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 dissipaters and tail water rating; design of headworks, distribution works, falls, cross-drainage works, outlets; river training.

9. ENVIROMENTAL ENGINEERING:
(a) Water Supply Engineering: Sources of supply, yields, design of intakes and conductors; estimation of demand; water quality standards; control of waterborne diseases; primary and secondary treatment, detailing and maintenance of treatment units, conveyance and distribution systems of treated water, leakage 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 sewage systems, pumping; characteristics of sewage and its treatment, disposal of products of sewage treatment, stream flow rejuvenation; institutional and industrial sewage management; plumbing systems; rural and semi urban sanitation.

(c) SOLID WASTER MANAGEMNT: Sources, classification, collection and disposal; design and management of landfills.

(d) AIR AND NOISE POLLUTION AND EXOLOGY: sources and effects of air pollution, monitoring of air pollution; noise pollution and standards; ecological chain and balance, environmental assessment.

10. ***(a) SOIL MECHANICS:*** Properties of soils, classification and interrelationship; compaction behavior, 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 solid, swelling and its prevention, foundation on swelling soils.

11. ***(a) SURVEYING:*** Classification of surveys, scales, accuracy; measurement of distances-direct and indirect methods; optical and electronic devices; measurement of directions, primatic 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 system, 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 system. Accessibility, net working. Tunneling, 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; containerization.

Harbours-layout, shipping lanes, anchoring, location identification; littoral transport with erosion and deposition; sounding methods; dry and wet docks, components and operations; tidal data and analysis.

Airport-layout and orientation; runway and taxiway design and drainage management; zoning laws; visual aids and air traffic control; helipads, hangers, service equipment.

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