Theroy of Reinforced and Prestressed Concrete

Detailed Syllabus;

1. Reinforced *Concrete* Fundamentals (working Stress Method): Concept of reinforced concrete, stress strain characteristics of concrete and steel reinforcement , elastic theory, singly reinforced, balanced section, under reinforce section and over reinforced section; analysis and design of singly reinforced doubly reinforced rectangular and T-sections, design of one way and two way slab as per IS-456(latest), shear and bond stresses and design for sheaf and bond, design of axially loaded columns, analysis of sections subjected to belling and axial fbrces(tension or compression)
Brief introduction to fundamentals of ultimate strength theory: curved stress distribution, compressive stress block, simplified rectangular stress block as per Whitney's approach, ultimate moment of resistance of singly reinforced section.

2. Limit state met tod of design as per IS 456 (latest edition): concepts of probability and reliability, characteristic loads, characteristic strength, partial safety factors for loads and materials/ introduction to limit states of collapse in flexure, direct compression, shear and limit states of serviceability in deflection and cracking; dijsign of singly and doubly reinforced rectangular and T sections for flexure, design of members'in shew and bond, design of axially loaded columns, design of one-way and two-way slabs, design of beam Objected to bending and torsion

3. Pre-stressed Concrete

3.1 Basic principles of pre-stressed concrete: materials used and their properties/methods and systems o| pre-stressing, losses in pre-stress, analysis of various types of sections subjected to pre-strcssind external loads

3.2 General design principles: cpnceptis of center of compression, kern of a section, efficiency of the section, pressure line and safe cable zone, principal tension in pre-stressed concrete members

Term Work:

Each student is to appear for at least one written test during the term. Solution of at least 20 problOTis with ne& sketcyes wherever necessary and the graded answer paper, of the test ishall be submitted as term work

Textbooks:

1. Plain and Reinforced Concrete, Vol. I, Jain & Jaikrishna, Nemchand Brothers.
2. Design of Reinforced Concrete Structures, Dayaratnam P, Oxford & IBH.
3. Design of Pre-stressed Concrete Structures, Lin T Y & Ned Burns John Wiley.
4. Prestressed Concrete, Krishna Raju, Tata McGraw Hill
5. Ultimate Strength Design for Structural Concrete, Arthur P D & Ramkrishnan V, Wheeler & co. pvt Ltd
6. Limit State Theory for Reinforced Concrete Design, Huges B P, Pitman.
7. Limit State design - Reinforced Concrete. Jain A K,
8. Reinforced Concrete, Warner R F, Rangan B C & Hall A S, Pitman.
9. Reinforced Concrete, H.J. Shah, Charotar Publisher.
10. Theory of reinforced Concrete, Shina& Roy
11. Prestressed Concrete, Evans R H &Benett E W, Chapman &Hall.
12. Limit State of Design - Reinforced Concrete, Shah &Karve,
13. Illustrated Reinforced Concrete Design, Dr. V.L. Shah & Dr. S.R. Karve, Structures

Construction Engineering

Detailed Syllabus

1 Construction equipment:

1.1 Standard types of equipment special equipment, cost of owt ing and Operating equipment, depreciation costs, investment and operating costs, economic life,sources of construction equipment, factors affecting selection of construction equipment balancing of equipment

1.2. Study of equipments with reference to available types and their capacities, factor, affecting their performance

1.2.1 Earthmoving equipment: tractors and attachments, dozers & rippers, scrapers, shovels, draglines, trenching machines, clamshell, hoes, trucks and wagons, dumpers, dozers, trenching machines rollers and compactors.

1.2.2 Drilling and blasting equipment: bits, jackhammers, drifters, drills, blasting material, firing charge, safety fuse, electric blasting caps, drilling pattern, transporting and handling *of* explosives

1.2.3 Pile driving equipment: types, pile driving hammers: single and double acting, differential acting hammers, hydraulic and diesel hammers, vibratory pile drivers

1.2.4 Pumping equipment: reciprocating, diaphragm & centrifugal pumps, wellpoint system

1.2.5 Stone crushing equipment: jaw, gyratory and cone crushes, hammer mills, roll crushers, rod and ball crushers, aggregate screens and screening plants, portable plants

1.2.6 Concrete manufacture, transport placing and compacting equipment; mixers, central batching and mixing plants, pavers, transit mixers, concrete pumps, shotcrete

1.2.7 Air compressor

1.2.8 Equipment for moving materials: builder's hoists, forklifts, cranes, belt-conveyors, cableways, ropeways

2 Tunneling: geo-technical investigations, selection of alignment, methods of tunneling in soft soils and in hard rock, sequence of operations for drilling and blasting method, mechanical moles, boomers, tunnel boring machines, mucking, ventilaition of tunnels, dust control, types of tunnel supports, sequence of lining Operation, lining with pneumatics placers and by pmpcrete method

3 Concrete construction: concreting under water, concreting-in different weather conditions, mass concreting, vaccum concrete, forms for concrete construction: slip forms, collapsible-forms, cantilever forms

4 Miscellaneous: sand drains, stone Columns, diaphragm wall ,rock anchors, cofferdams, foundation grouting

Term work:

Each student to appear for at least one written test during the term. At least two site visits shou|d be arranged to give an exposure to various construction techniques discussed in the above syllabul. A report on site visit, at least 10 assignments (including sketches for various equipment and construction details) and the graded answer paper for the term test shall be submitted as term work.

Recommended books:

1. Varrna Mahesh, Construction Equipment & its Planning and Applications, Metropolitan
2. R L Purifoy and Ledbetter, Construction Equipment and Planning, McGraw Hill
3. USBR, Earth Manual .
4. USBR, Concrete Manual
5. Wadell, Concrete Construction Handbook,
6. O'Brien, Havers & Stubb, Handbook of Heavy Construction, McGraw Hill

7. JagadishLal, Construction Equipment
8. Subhash Saxena, Tunnel Engineering
9. Wc Teng, Foundation design
10. Bowels J E, Foundation Analysis and Design

Irrigation Engineering

Detailed Syllabus:

1.Introduction: irrigation, water resources in India, need of Irrigation in India, development of irrigation in India, impact of irrigation on human environment, irrigation systems: minor and —major, command area development

2.Hydrology: hydrologic cycle, rainfall - runoff process, factors affecting runoff, runoff hydrograph,crunoff computations, flood discharge calculation, unit hydrograph method, S-hydrograph

3.Water requirement of crops:

3.1 Crops and crop seasons in India, cropping pattern, duty and delta

3.2 Quality of irrigation water

3.3 Soil-water relationships: soil characteristics significant from irrigation considerations, zone soil water, infiltration, consumptive, use, irrigation requirement, frequency of irrigation

3.4 Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle/drip irrigation

4.Ground water and well hydrology

4.1 Ground water resources, occurrence of ground water, methods of ground water exploration, well irrigation

4.2 Well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifers, aquifer tests, design of water wells

5.Distribution system:

5.1 Canal systems, alignment of canals, canal losses, estimation of design discharge

5.2 Design of channels: rigid boundary channels carrying clear and sediment laden water, alluvial channels carrying clear and sediment laden water, Kennedy's and Lacey's theory of regime channels

5.3 Canal outlets: non-modular, scmi-ipodular and modular outlets

5.4 Waterlogging: causes, effects and Remedial measures

5.5 Lining of canals: economics of linihg, types of lining

5.6 Drainage of irrigated lands: necessity, methods

6.Canal structures:

6.1 Surface arid sub-surface flow considerations for design of canal structures: hydraulic jump,
seepage forced uplift forces

6.2 Canal fall's, cross regulator, distributary head regulator, canal escapes: types, components and design considerations

6.3 Cross drainage works: need, types, design considerations

7.Canal headworks:

7.1 Weir and barrage, different units of headworks, types of weirs, sediment control in canals, river training for canal headworks

7.2 Theories of seepage for design of weirs: Bligh's creep theory. Lane's weighted creep theory, Khosala's method of independent variables

8.Dams and spin ways:

8.1 Embankment dams: Classification, selection of site for dam, design considerations, estimation an<i control of seepage, slopes protection

8.2 Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile, structural joints, keys and water seals galleries, outlets

8.3 Arch and *I buttress* dams: types
8.4 Spillways components of spillway, types, terminal structures, types of gates for spillway crests
9.Reservoirs: types, capacity Of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of Suitable site, flood routing

Term work:
Each student ii: to appear for at least one written test during the term. At least 10 numerical problems and 0 descriptive assignments including sketches of relevant hydraulic structures and the graded ins answer paper for the term test shall be submitted as term work.

Text books:
1. G L Asawa, Irrigation EngineeringWiley eastern
2. S K Garg, Irrigation Engineering *&* Hydraulic Structures, Khanna Publishers
3. PN Modi, Irrigation Engineering & Hydraulic Structures,
Reference books:
1. J D Zimmerman, Irrigation, John Wiley & Sons
2. Varshney, Gupta & Gupta, Theory and Design of Irrigation Structures, Nem Chahd & Bros
3. Punmia B C & Pande B B lal, irrigation Engineering and Water Power Engineering, Laxmi Publications

Environmental Engineering

Detailed Syllabus:
1 Water
1.1 Man's environment: Importance of environmental sanitation.
1.2 Water supply systems: Need for planned water supply schemes, components of water supply system and determination of their design capacities.
1.3 Quality of water: Wholesomeness and palatability; physical, chemical, bacteriological standards,
1.4 treatment of water; impurities in, water-processes for th sir removal - typical flow-sheets.
1.5 Sedimentation: factors affecting efficiency, design values of various parameters, tube settlers.
1.6 Coagulation and flocculation;, mechanisms, common coagulants, rapid mixing and flocculating devices, G and GT values, Jar test, coagulant aids - polyelectrolytes etc.
1.7 Filtration: classification, slow and rapid sandTilters, dial media filters, sand, gravel and under-drainage system, mode Of action, cleaning, Imitations, operational difficulties, performance, basic design consideration, pressure filter: construction and operation
1.8 Water softening: lime soda and base exchange methods, principle reactions, design considerations, sludge disposal.
1.9 Miscellaneous treatments: removal of Iron and manganese, taste, odour and colour, principles and methods; de-fluoridation, reverse osmoses.
1.10 Disinfection: chlorination, chemistry of chlorination. kinetics of disinfection, chlorine demand, free and combined chlorine, break point chlorination, superchlorinalion, dechlorination, chlorine residual, use of iodine, ozone, ultraviolet rays and chlorine dioxide as disinfectants, well water disinfection, ;
2 Sewage:

2.1 Characteristics of sewage: composition, chemistry of sanitary sewage, B.O.D., COD., aerobic and anaerobic decomposition.

2.2 Sewage Disposal: discharge of raw and treated sewage,;e on land and water, standards for disposal of raw and treated sewage on land and water, Limits of dilution.

2.3 Self purification of streams: oxygen economy, sewage, farming.

2.4 Sewage treatment, aims, methods of treatment and various flow-sheets for preliminary, primary,secondary and tertiary treatment, screens, grit chambers, primary and secondary clarifiers, disposal of screenings and grit.

2.5 Biological treatment methods; principles, trickling filter operation, re-circulation, activated sludge process and its modifications, hydraulic design of trickling filter and activated sludge process, sludge volume index, operational problems in activated sludge-process and trickling filters, Stabilization ponds.

2.6 Sludge digestion: principles of anaerobic digestion, quantity and characterisation of sludge, design of sludge digestion tanks, disposal of digested sludge, drying beds

2.7 Low cost sanitation: septic tanks and Imhoff tanks - principles, operation and suitability, design values, disposal of treated effluent.

Elective I Prestressed Concrete

Detailed Syllabus

1 Introduction to prestressed concrete: basic concept and general principles, materials used and their properties, methods and techniques of prestressing, prestressing systems, loss of prestress

2 Analysis of prestressed concrete sections: loading stages and compuattion of section properties, critical sections under working load for pretensioned and post tensiotfcd members, load balancing method of analysisof prestressjd concrete beams.

3 Design of prestressed concrete sections for flexure: general philosophy of design, design approaches in working stress method and limit stress method, critical conditions for design, limit state of collapse in flexure, permissible stresses in concrete antjsteel, kern points, choice and efficiency of sections, cable profiles and layouts, cable rone/deflections of prestressed concrete members

4 Design for shear: calculation of principle tension under working load, permissible principle tension, shear strength calculation under limit-state of collapse for both sections cracked and uncracked in flexure

5 End zone stresses in prestressed concrete members: pretension transfer bond, transmission length, end block of post-tensioned members

6 Design of prestressed concrete beams: design of simply supported pretensioned and post tensioned slabs and beams, introduction to application of prestreSsing to-continuous beams,
linear transformation and concordancy of cables

Term work:

1.Solution of at least 10 problems based on the above syilat us and a design of report along with one imperial size drawing sheet on design of a post tensioned prestressed concrete beam.

2. At least one class test based on the above syllabus. Graded answer books shall be attached to the journal.

Recommended Books:

1. Plain and Reinforced Concrete Vol. I; Jain & Jaikrishna, Nemchand Brothers.

2. Design of Reinforced Concrete Structures, Dayaratnam 8, Oxford & IBH.
3. Reinforced Concrete Structure Sayal & Goel, Wheeler.
4. Design of Prestressed Concrete Structures, T. Y. Lin & N. H. Burns
5. Prestressed Concrete, R. H. Evafis & E.W. Bennet.
6. Prestressed Concrete, N. Krishna Raju.
7. Modern Prestressed Concrete, James Libby,
8. Prestressed Concrete Analysis and Design, Antoine F. Naaman.
9. Prestressed Concrete, Vol. I, I. Y, Guyon