

Sixth Semester

BTCE-601 DESIGN OF CONCRETE STRUCTURES-II

Internal Marks: 40
External Marks: 60
Total Marks: 100

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Note: Relevant Indian Codes of Practice and Design handbooks are permitted (as per note mentioned below) in Examination.

1. Stairs : Types and Design of Stairs
2. Foundations - Theory and Design: Isolated Footing (Square, Rectangular), Combined Footing(Rectangular, Trapezoidal, Strap), Raft Footing
3. Compression Members: Definitions, Classifications, Guidelines and Assumptions, Design of Short Axially Loaded Compression Members, Design of Short Compression Members under Axial Load with Uniaxial and biaxial Bending, Preparation of Design Charts, Design of Slender Columns
4. Design of Continuous beams and curved beam.
5. Design of Domes.
6. Design of Retaining walls: Cantilever type retaining wall, Counterfort type retaining wall.
7. Introduction to water retaining structures. Design of circular and rectangular water tanks resting on ground.

Books:

1. Reinforced Concrete Design; Pillai & Menon; Tata McGraw-Hill Education
2. Limit state Design of Reinforced Concrete; Varghese P C; Prentice-Hall of India Pvt. Ltd”.
3. Reinforced Cement Concrete, Mallick and Rangasamy; Oxford-IBH.

BIS Codes of practice and Design Handbooks:

1. *IS 456-2000*- Indian Standard. Plain and Reinforced concrete -Code of practice
2. *IS 3370- Code of practice for concrete structures for storage of liquids
3. *Design Aid SP 16
4. Explanatory hand book SP24.
5. Detailing of Reinforcement SP 34

Note: The codes marked with * are permitted in examination.

BTCE-602 ELEMENTS OF EARTHQUAKE ENGINEERING

Internal Marks :	40	L T P
External Marks :	60	3 2 0
Total Marks :	100	

Note: No Indian Codes of Practice and Design handbooks are permitted, so paper setter is expected to provide required data from relevant IS codes, for any numerical or design part.

1. Introduction to Earthquakes, Causes of Earthquakes, Basic Terminology, Magnitude, Intensity, Peak ground motion parameters.
2. Past Earthquakes and Lessons learnt, Various Types of Damages to Buildings.
3. Introduction to theory of Vibrations, Sources of Vibrations, Types of Vibrations, Degree of Freedom, Spring action and damping, Equation of motion of S.D.O.F. systems, Undamped, Damped system subjected to transient forces, general solution, green's function.
4. Lateral Force analysis, Floor Diaphragm action, moment resisting frames, shear walls.
5. Concepts of seismic design, Lateral Strength, Stiffness, ductility and structural configuration.
6. Introduction to provisions of IS 1893-2002 Part-I for buildings. Estimation of lateral forces due to earthquake.
7. Introduction to provisions of IS 4326.
8. Introduction to provision of IS 13920.

References :

1. Earthquake Resistant Design of Structures, Pankaj Agrawal, Manish Shrikhande, PHI Learning
2. Dynamics of Structures: Theory and Applications to Earthquake Engineering, AK Chopra, Prentice Hall
3. Dynamics of Structures, R.W. Clough and Joseph Penzien, McGraw-Hill Education
4. Structural Dynamics by Mario & Paz, Springer.
5. Earthquake Resistant Design by David J. Dowrick, Wiley India Pvt Ltd
6. Elements of Earthquake Engg by Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra, South Asian Publishers.
7. IS 1893-2002 Indian Standard Criteria for Earthquake Resistant Design of Structures.
8. IS 4326-1993 2002 Indian Standard for Earthquake Resistant Design and Construction of Buildings.
9. IS 13920-1993 2002 Ductile detailing of Reinforced Concrete Structures subjected to Seismic Forces.

BTCE-603 FOUNDATION ENGINEERING

Internal Marks: 40
External Marks: 60
Total Marks: 100

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Soil Investigation: Object of soil investigation for new and existing structures. Depth of exploration for different structures. Spacing of bore Holes. Methods of soil exploration and relative merits and demerits. Types of soil sample. Design features of sampler affecting sample disturbance. Essential features and application of the following types of samples- Open Drive samples, Stationery piston sampler, Rotary sampler, Geophysical exploration by seismic and resistivity methods. Bore Hole log for S.P.T.

Earth Pressure Terms and symbols used for a retaining wall. Movement of all and the lateral earth pressure. Earth pressure at rest. Rankine states of plastic equilibrium, K_a and K_p for horizontal backfills. Rankine's theory both for active and passive earth pressure for Cohesionless backfill with surcharge and fully submerged case. Cohesive backfill condition. Coulomb's method for cohesion less backfill. Merits and demerits of Ranking and Coulomb's theories, Culmann's graphical construction (without surcharge load).

Shallow Foundation: Type of shallow foundations, Depth and factors affecting it. Definition of ultimate bearing capacity, safe bearing capacity and allowable bearing capacity. Rankine's analysis and Terzaghi's analysis. Types of failures. Factors affecting bearing capacity. Skempton's equation. B.I.S. recommendations for shape, depth and inclination factors. Plate Load test and standard penetration Test.

Bosussinesq equation for a point load, uniformly loaded circular and rectangular area, pressure distribution diagrams. Newmarks chart and its construction. 2:1 method of load distribution. Comparison of Bosussinesq and Westerguard analysis for a point load. Causes of settlement of structures, Comparison of immediate and consolidation settlement, calculation of settlement by plate load Test and Static Cone penetration test data. Allowable settlement of various structures according to I.S. Code. Situation most suitable for provision of rafts, Proportioning of rafts, Methods of designing raft, Floating foundation.

Pile Foundations: Necessity and uses of piles, Classification of piles, Merits and demerits of different types based on composition. Types of pile driving hammers & their comparison. Effect of pile driving on adjacent ground. Use of Engineering News Formula and Hiley's Formula for determination of allowable load. Limitations of pile driving formulae. Cyclic Pile Load Test, Separation of skin friction and point resistance using cyclic pile load test.

Determination of point resistance and frictional resistance of a single pile by Static formulas. Piles in Clay, Safe load on a Friction and point Bearing pile. Pile in sand, Spacing of piles in a group, Factors affecting capacity of a pile group, Efficiency of pile group by converse - Labare formula and feeds formulas. Bearing capacity of a pile group in clay by block failure and individual action approach. Calculation of settlement of friction pile group in clay. Related Numerical problems. Settlement of pile groups in sand, Negative skin friction. Related numerical problem

Caissons and Wells: Major areas of use of caissons, advantages and disadvantages of open box and pneumatic caissons. Essential part of a pneumatic caisson. Components of a well foundation. Calculation of allowable bearing pressure. Conditions for stability of a well, Forces acting on a well foundation. Computation of scour depth.

Books -

1. Soil Mech. & Foundation Engg, by K.R.Arora, Standard Publishers Distributors
2. Geotechnical Engineering, by P. Purshotama Raj
3. Soil Mech. & Foundation Engg., by V.N.S.Murthy
4. Principle of Foundation Engineering by B.M.Das, CL Engineering
5. Basic and applied Soil Mechanics by Gopal Ranjan and A.S.R.Rao, New Age International
6. Soil Mech. & Foundations by Muni Budhu Wiley, John Wiley & Sons
7. Geotechnical Engineering by Gulhati and Datta, Tata McGraw - Hill Education
8. Foundation Engineering by Varghese P.C, PHI Learning.
9. Problems in Soil mechanics and Foundation Engineering by B.P.Verma, Khanna Publication.
10. Foundation Analysis and Design by Bowles J.E, Tata McGraw - Hill Education

BTCE-604 NUMERICAL METHODS IN CIVIL ENGINEERING

Internal Marks: 40
External Marks: 60
Total Marks: 100

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- 1. Equation:** Roots of algebraic transcendental equation, Solution of linear simultaneous equations by different methods using Elimination, Iteration, Inversion, Gauss-Jordan and method. Homogeneous and Eigen Value problem, Nonlinear equations, Interpolation.
- 2. Finite Difference Technique:** Initial and Boundary value problems of ordinary and partial differential equations, Solution of Various types of plates and other civil engineering related problems
- 3. New Marks Methods:** Solution of determinate and indeterminate structures using Newmarks Procedure (Beam)
- 4. Statistical Methods:** Method of correlation and Regression analysis for fitting a polynomial equation by least square
- 5. Initial Value problem:** Galerkin's method of least square, Initial Value problem by collocation points, Rungekutta Method
- 6. New Marks Method:** Implicit and explicit solution, solution for nonlinear problems and convergence criteria

Books:

1. Numerical Mathematical Analysis: James B. Scarborough Oxford and IBH Publishing, 1955.
2. Introductory Methods of Numerical Analysis: S.S. Sastry, PHI Learning (2012).
3. Introduction To Computer Programming and Numerical Methods by Xundong Jia and Shu Liu, Dubuque, Iowa: Kendall/Hunt Publishing Co.
4. Numerical Methods, J.B Dixit , USP (Laxmi publication),

BTCE-605 PROFESSIONAL PRACTICE

Internal Marks: 40
External Marks: 60
Total Marks: 100

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1. **Estimates**-Method of building estimates, types, site plan index plan, layout plan, plinth area, floor area, Technical sanction, administrative approval, estimate of buildings, roads, earthwork, R.C.C. works, sloped roof, roof truss, masonry platform, complete set of estimate.
2. **Schedule of Rates, analysis of rates**- For earthwork, concrete work, D.P.C., stone masonry, plastering, pointing, roadwork
3. **Specifications**- For different classes of building and Civil engineering works.
4. Rules and measurements for different types of Civil engineering works.
5. **Types of contracts**- Tenders, tender form, submission and opening of tenders, measurement book, muster roll , piecework agreement and work order
6. **Accounts**-Division of accounts, cash, receipt of money, cash book, temporary advance, imprest, accounting procedure
7. **Arbitration**: Acts and legal decision making process.

Books Recommended

1. Estimating and Costing by B.N. Datta, UBSPD, New Delhi
2. Estimating and Costing by G.S. Birdie, Dhanpat Rai Publication New Delhi .
3. Estimating and Costing by V.N. Chakravorty, Calcutta
4. Civil Engg. Contracts & Estimates by B.S. Patil, Orient-Longman Ltd., New Delhi.

BTCE-606 ENVIRONMENTAL ENGINEERING - II

Internal Marks: 40
External Marks: 60
Total Marks: 100

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- 1. Introduction:** Terms & definitions, systems of sanitation and their merits and demerits, system of sewerage, choice of sewerage system and suitability to Indian conditions.
- 2. Sewerage System:** Generation and estimation of community Sewage, flow variations, storm water flow, types of sewers. Design of sewers and storm water sewers, construction & maintenance of sewers, sewer appurtenances, sewage pumping and pumping stations.
- 3. House Drainage:** Principles of house drainage, traps, sanitary fittings, systems of plumbing, drainage lay out for residences.
- 4. Characteristics of Sewage:** Composition of domestic and industrial sewage, sampling, physical, chemical and microbiological analysis of sewage, biological decomposition of sewage, BOD and BOD kinetics, effluent disposal limits.
- 5. Treatment of Sewage:** Introduction to unit operations and processes - Primary treatment; screening (theory), grit chamber (theory and design), floatation units, sedimentation tanks (theory and design), Secondary treatment units; ASP (theory and design), Sequencing batch reactors (theory and design), Trickling filters (theory and design) Anaerobic systems; Anaerobic filters (theory), UASB (theory), Anaerobic lagoons, Sludge Handling and disposal; thickening, stabilization, dewatering, drying and disposal.
- 6. Low Cost Sanitation Systems:** Imhoff tanks (theory and design), septic tank (theory and design), soakage pit/soil absorption systems; stabilization ponds (theory and design); macrophyte ponds; oxidation ponds (theory and design); and constructed wetland systems.
- 7. Wastewater Treatment Plants and Advanced Wastewater Treatment:** Treatment Plants; site selection, plant design, Hydraulic Profiles, operation and maintenance aspects. Advanced wastewater treatment for nutrient removal, disinfection and polishing.

Books:

1. Waste Water Engg. (Environmental Engg.-II) by B.C.Punmia, Ashok Jain, Laxmi Publications, New Delhi.
2. Environmental Engg. - A design Approach by Arcadio P. Sincero and Gregoria P. Sincero, Prentice Hall of India, New Delhi.
3. "Waste Water Engineering - Treatment and Reuse" by Metcalf & Eddy, TMH, New Delhi.
4. "Environmental Engg." By Howard S. Peavy, Donald R. Rowe & George Tchobanoglous, McGraw Hill, International Edition
5. Environmental Engineering (Vol. II) by S.K. Garg, Khanna Publishers, Delhi.

BTCE -607 ENVIRONMENTAL ENGINEERING LABORATORY

Internal Marks: 30
External Marks: 20
Total Marks: 50

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1. To measure the pH value of a water/waste water sample.
2. To determine optimum Alum dose for Coagulation.
3. To find MPN for the bacteriological examination of water.
4. To find the turbidity of a given waste water/water sample
5. To find B.O.D. of a given waste water sample.
6. To measure D.O. of a given sample of water.
7. Determination of Hardness of a given water sample
8. Determination of total solids, dissolved solids, suspended solids of a given water sample.
9. To determine the concentration of sulphates in water/wastewater sample.
10. To find chlorides in a given sample of water/waste water.
11. To find acidity/alkalinity of a given water sample
12. To determine the COD of a wastewater sample.

Books Recommended:

1. Chemistry for Enviromental Engg. and Science by Sawyer & McCarty, TMH, New Delhi
2. Standard Methods for the examination of water & wastewater, APHA, AWWA, WE

BTCE-608 COMPUTER AIDED STRUCTURAL DRAWING - II

Internal Marks: 30
External Marks: 20
Total Marks: 50

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Structural Drawings of Reinforced Concrete Elements as per BTCE-601