

## **BTCE-401 Geomatics Engineering**

Internal Marks: 40

External Marks: 60

Total Marks: 100

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### **1. Photogrammetry**

Introduction, Basic Principles, Photo-Theodolite, Elevation of a Point by Photographic Measurement, Aerial Camera, Vertical Photograph, Tilted Photograph, Scale, Crab and Drift, Flight Planning for Aerial Photography, Ground Control for Photogrammetry, Photomaps and Mosaics, Stereoscopic Vision, Stereoscopic parallax, Stereoscopic Plotting Instruments, Applications.

### **2. Electromagnetic Distance Measurement (EDM)**

Electromagnetic Waves, Carrier Waves, Black body radiation, Laws of radiation Modulation, Types of EDM Instruments, Electro-optical, Infrared, and Microwave EDM Instruments, Effect of Atmospheric Conditions, The Geodimeter, The Tellurometer, Wild Distomats, Electronic Total Station.

### **3. Remote Sensing**

Introduction, Basic Principles, Electromagnetic (EM) Energy Spectrum, EM Radiations and the Atmosphere, Interaction of EM radiations with Earth's Surface, Types of remote sensing systems, Remote Sensing Observation Platforms, Satellites and their characteristics – Geostationary and sun-synchronous, Earth Resources Satellites, Meteorological satellites, Sensors, Types and their characteristics, Across track and Along track scanning, Applications of Remote Sensing.

### **4. Geographical Information System (GIS)**

Definition, GIS Objectives, Hardware and software requirements for GIS, Components of GIS, Coordinate System and Projections in GIS, Data structure and formats, Spatial data models – Raster and Vector, Data inputting in GIS, Data base design - editing and topology creation in GIS, Linkage between spatial and non spatial data, Spatial data analysis – significance and type, Attribute Query, Spatial Query, Vector based spatial data analysis, Raster based spatial data analysis, Errors in GIS, Integration of RS and GIS data, Digital Elevation Model, Network Analysis in GIS, GIS Software Packages.

### **5. Global Positioning System (GPS)**

Introduction, Fundamental concepts, GPS system elements and signals, GPS measurements and accuracy of GPS, Satellite Movement, GPS Satellites, Co-ordinate systems - Geoids, Ellipsoid and Datum, Spheroid, Customised Local Reference Ellipsoids, National Reference Systems, Worldwide Reference Ellipsoid, WGS 84, Differential-GPS, Classification of GPS receivers, GPS Applications.

### **Books Recommended:**

1. Arora, K.R., 2007: Surveying Vol-III, Standard Book House.
2. Campbell, J.B.2002: Introduction to Remote Sensing. Taylor Publications.
3. Chang.T.K. 2002: Geographic Information Systems, Tata McGrawHill.
4. Heywood.I, Cornelius S, CrverSteve. 2003: An Introduction to Geographical Information Systems, Pearson Education.
5. Joseph George, 2003: Fundamentals of Remote Sensing. Universities Press.
6. Punmia, B.C., Jain A.K., 2005: Higher Surveying, Luxmi Publications
7. Sabbins, F.F., 1985: Remote Sensing Principles and Interpretation. W.H.Freeman and company.
8. Kaplan, E.D., Understanding GPS : Principles and Application; Artec House; 2 Edition

## **BTCE-402 CONSTRUCTION MACHINERY & WORKS MANAGEMENT**

Internal Marks: 40

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External Marks: 60

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Total Marks: 100

**1. INTRODUCTION** :Need for project planning & management, time, activity & event, bar chart, Milestone chart, uses & draw backs.

**2. PERT** :Construction of PERT network, time estimates, network analysis, forward pass & backward pass, slack, critical path, data reduction, suitability of PERT for research project, numerical problems.

**3.CPM** :Definitions, network construction, critical path, fundamental rules, determination of project schedule, activity time estimates, float types, their significance in project control, numerical problems.

**4. COST ANALYSIS AND CONTRACT** :Type of costs, cost time relationships, cost slopes, conducting a crash programme, determining the minimum total cost of project, numerical problems. updating a project, when to update, time grid diagram, resource scheduling. planning of different components of civil engineering projects such as a house, workshop, dam, tunnel.

**5. CONSTRUCTION EQUIPMENT AND MACHINERY** :Tractors, bull dozers, rippers, scrappers, power shovels, dragline, hoes. Line diagram of each, sizes, output, uses, factors affecting selection of each equipment, economic life of equipment,maintenance and repair cost.

Hoisting & Transporting Equipments: Hosts, Winches, Cranes, Belt conveyors, Ropeways, trucks & Wagons.

**6.** :Plants for grading, batching, mixing, types of mixers, concrete pumps, bitumen plants.

### **BOOKS RECOMMENDED:**

Construction Planning and Equipment - R.L.Peurifoy - Tata McGraw Hill, New Delhi

PERT and CPM - L.S.Srinath, East West Press

Management Guide to PERT & CPM - Wiest & levy; Prentice Hall

Construction Equipment & Planning and Application. - Mahesh Verma Artec Publication.

Construction Planning and Management by U. K. Shrivastava; Galgotia Publications Pvt. Ltd.

## **BTCE-403 DESIGN OF CONCRETE STRUCTURES-I**

Internal Marks: 40

External Marks: 60

Total Marks: 100

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Note: Relevant Indian Code of Practices are permitted in Examination.

### **Part A: CONCRETE TECHNOLOGY**

1. **CEMENTS & ADMIXTURES:** Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrate cement – Test on physical properties – Different grades of cement – Admixtures – Mineral and chemical admixtures.
2. **AGGREGATES:** Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum aggregate size.
3. **Properties of Concrete:** Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water, Abram's Law, Factors affecting strength; Characteristics strength of concrete, Target strength, Modulus of elasticity, Modulus of rupture
4. **MIX DESIGN :** Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design.

### **Part B: DESIGN OF REINFORCED CONCRETE ELEMENTS**

1. Objectives and Methods of Analysis and Design
2. Properties of Concrete and Steel
3. Design Philosophies of Working Stress Method and Limit State Method
4. Limit State of Collapse - Flexure
5. Computation of Parameters of Governing Equations
6. Determination of Neutral Axis Depth and Computation of Moment of Resistance
7. Numerical Problems on Singly Reinforced Rectangular Beams
8. Doubly Reinforced Beams – Theory and Problems
9. Flanged Beams – Theory and Numerical Problems
10. Shear, Bond, Anchorage, Development Length and Torsion
11. Reinforced Concrete Slabs: One and Two way Slabs

## BOOKS:

1. Properties of Concrete by A.M.Neville – Prentice Hall
2. Concrete Technology by M.S.Shetty. – S.Chand & Co.;
3. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
4. Concrete Technology by A.R. Santha Kumar, Oxford university Press, New Delhi
5. Advanced Design of Structures N. Krishna Raju
  
6. Advanced RCC Design Pillai & Mennon  
; Tata MacGraw Hill
7. Limit State Design Ramachandra
  
8. Limit State Design A.K. Jain
  
9. Limit State Design of Reinforced Concrete P.C. Vergese

## BTCE- 404 Fluid Mechanics-II

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

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**1. Laminar Flow:** Navier-stokes equations in Cartesian coordinates (no derivation), meaning of terms, Flow through circular section pipe, flow between parallel plates, stokes law. Flow through porous media,. Transition from laminar to turbulent, Critical velocity and critical Reynolds Number

**2. Turbulent Flow:** Turbulent flows and flow losses in pipes, Darcy equation minor head losses in pipe fittings, hydraulic and energy gradient lines. Definition of turbulence, scale and intensity, Effects of turbulent flow in pipes. Equation for velocity distribution in smooth and rough pipes (no derivation). Resistance diagram.

**3. Boundary Layer Analysis:** Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and Turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control.

**4. Uniform flow in open Channels:** Flow classifications, basic resistance Equation for open channel flow. Chezy, Manning, Bazin and Kutter formulae. Variation of roughness coefficient, conveyance and normal depth. Velocity Distribution. Most efficient flow sections; rectangular, trapezoidal and circular.

**5. Energy and Momentum principles and critical flow:** Energy and specific Energy in an open channel;critical depth for rectangular and trapezoidal channels. Alternate depths, applications of specific energy to transitions and Broads crested weirs. Momentum and specific force in open channel flow, sequent depths.

**6. Gradually varied Flow:** Different Equation of water surface profile; limitation, properties and classification of water and surface profiles with examples, computation of water surface profile by graphical, numerical and analytical approaches.

**7. Hydraulic Jump and Surges:** Theory of Jump, Elements of jump in a rectangular Channel, length and height of jump, location of jump, Energy dissipation and other uses, Positive and negative surges

### **Books:**

5. Hydraulics & Fluid Mechanics by P.N.Modi and S.M.Seth; Standard Publication
6. Flow in Open Channels by S.Subraminayam; Tata MacGraw Hill
7. Introduction to Fluid Mechanics by Robert N.Fox & Alan T.Macnold
8. Fluid Mechanics : Dr. R.K. Bansal; Laxmi Publications
9. Fluid Mechanics : Dr. Jagdish Lal; Metropolitan Book Co. (p) Ltd.

## **BTCE-405 IRRIGATION ENGINEERING –I**

Internal Marks: 40

External Marks: 60

Total Marks: 100

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1. **INTRODUCTION:**Importance of Irrigation Engineering, purposes of Irrigation, objectives of Irrigation, Benefits of Irrigation, Advantages of various techniques of irrigation- Furrow Irrigation, Boarder strip Irrigation, Basin Irrigation, Sprinkler Irrigation , Drip Irrigation.

2. **METHODS OF IRRIGATION:**Advantages and disadvantages of irrigation, water requirements of crops, factors affecting water requirement, consumptive use of water, water depth or delta , Duty of water, Base Period, relation between delta, duty and base period, Soil crop relation-ship and soil fertility.

3. **CANAL IRRIGATION:**Classifications of canals, canal alignment, Inundation canals, Bandhara irrigation, advantages and disadvantages, Silt theories-Kennedy's theory, Lacey's theory, Drawbacks in Kennedy's & Lacey's theories, comparison of Lacey's and Kennedy's theories, Design of unlined canals based on Kennedy & Lacey's theories.

4. **LINED CANALS:**Types of lining, selection of type of lining, Economics of lining, maintenance of lined canals, silt removal, strengthening of channel banks, measurement of discharge in channels, design of lined canals, methods of providing drainage behind lining.

5. **LOSSES IN CANALS, WATER LOGGING AND DRAINAGE:**Losses in canals-Evaporation and seepage, water logging, causes and ill effects of water logging anti wter logging measures. Drainage of land, classification of drains - surface and subsurface drains, Design considerations for surface drains, Advantages and maintenance of tile drains.

6. **INVESTIGATION AND PREPARATION OF IRRIGATION PROJECTS:**Classification of project, Project preparation-investigations, Design of works and drawings,concept of multi - purpose projects, Major, Medium and miner projects, planing of an irrigation project, Economics & financing of irrigation works. Documentation of project report.

7. **TUBE - WELL IRRIGATION :**Types of tube wells - strainer type, cavity type and slotted type. Type of strainers, Aquifer, porosity, uniformity coefficient, specific yield & specific retention, coefficients of permeability,transmissibility and storage. Yield or discharge of a tube well, Assumptions , Theim's & Dupuit's formulae, Limitations of Theim's and Dupuit's formulae. Interference of tube wells with canal or adjoining tube-wells, causes of failure of tubewells, optimum capacity, Duty and delta of a tube well. Rehabilitation of tubewell.

8. **RIVER TRAINING WORKS:**Objectives, classification of river-training works, Design of Guide Banks. Groynes or spurs - Their design and classification ISI. Recommendations of Approach embankments and afflux embankments, pitched Islands, Natural cut-offs and Artificial cut-offs and design Considerations.

Books:-

Principles & practice of Irrigation Engg. S.K.Sharma; S. Chand, Limited.

Irrigation & Water Power Engg. B.C. Punmia, Pande B.B.Lal; Laxmi Publications (p) Ltd

Fundamentals of Irrigation Engg. Dr. Bharat Singh; Nem Chand & Bros

Irrigation Engg. & Hydraulic Structure S.R.Sahasrabudhe; S. K. Kataria & Sons

Irrigation Engg. & Hydraulic Structure Varshney, Gupta & Gupta; Nem Chand and Brothers

Irrigation Engg. & Hydraulic Structure Santosh Kumar Garg; Khanna Publishers

## **BTCE- 406 STRUCTURAL ANALYSIS- I**

Internal Marks: 40

External Marks: 60

Total Marks: 100

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**Displacements:** Concept; Governing differential equation for deflection of straight beams; Following methods for determination of structural displacements:

10. Geometric Methods: Double integration; Macaulay's method; Moment area method; Conjugate beam method.
11. Energy Methods: Strain energy in members, , Betti's and Maxwell's Laws of reciprocal deflections, Concept of Virtual work and its applications, Castigliano's theorems, unit load method, deflections of trusses and 2D-frames.

**Determinate Structures:** Concept of determinacy; Analysis of determinate structural elements—truss, arch, beam, frame, cables; Internal forces in determinate structures; Reaction diagram-- Bending moment, shear force, radial shear, normal thrust diagrams for the determinant structures.

12. Analysis of plane trusses, compound and complex trusses using method of joints, method of joints, tension coefficients.
13. Analysis of three-hinged arch of various shapes under different loading conditions.
14. Analysis of simple portal frame, cables under different loading conditions.
15. Analysis of cables under point load and UDL with ends at same or different levels.

**Moving Loads and Influence Line Diagrams:** Concept of influence line diagram, rolling loads; Bending moment and shear force diagrams due to single and multiple concentrated rolling loads, uniformly distributed moving loads; Equivalent UDL; Muller Breslau principle; Influence lines for beams, girders with floor beams and frames; calculation of the maximum and absolute maximum shear force and bending moment; Concept of envelopes; Influence line for displacements; Influence line for bar force in trusses.

**Analysis of Cables and Suspension Bridges:** General cable theorem, shape, elastic stretch of cable, maximum tension in cable and back-stays, pressure on supporting towers, suspension bridges, three hinged stiffening girders.

**Analysis of Dams, Chimneys and Retaining Walls:** Introduction, loadings for the dams, chimneys, and retaining walls; limit of eccentricity for no-tension criteria; Concept of core; Middle-third rule; maximum/minimum base pressures.

### **Book Recommended**

- 1 Basic structural Analysis C.S.Reddy; Tata McGraw-Hill Education
- 2 Analysis of Structures Vol- I and Vol.-II Vazirani & Ratwani; Khanna Publishers
- 3 Intermediate structural Analysis C.K.Wang; McGraw-Hill
- 4 Advanced Structural Analysis, A.K. Jain, Nem Chand & Bros., Roorkee.
- 5 Theory of Structures, Vol. I, S.P. Gupta & G.S.Pandit, Tata McGraw Hill, New Delhi.

## **BTCE-407 CONCRETE TECHNOLOGY LAB**

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

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### **List of experiments:**

1. To Determine the Specific Gravity of and Soundness of cement
2. To Determine the Standard Consistency, Initial and Final Setting Times of Cement and Compressive Strength of Cement.
3. To Determine the Fineness Modulus, Bulk Density, Water Absorption and Specific gravity of Fine and Coarse Aggregates.
4. To Determine the Slump, Compaction Factor and Vee-Bee Time of Concrete.
5. Mix Design of Concrete by IS methods
6. To Determine the Compressive Strength of Concrete by Cube and Cylinder.
7. To carry out the Split Tensile and Flexural strength of Concrete.
8. Compressive strength of Brick and Tile as IS standard

### **Books/Manuals :-**

1. Concrete Manual By Dr. M.L. Gambhir, Dhanpat Rai & Sons Delhi.
2. Concrete Lab Manual by TTTI Chandigarh
3. Concrete Technology, Theory and Practice by M.S.Shetty. S.Chand & Company.



**BTCE-408 Structural Analysis Lab**

**Internal Marks: 30**

**External Marks: 20**

**Total Marks: 50**

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**List of Experiments**

1. Deflection of a simply supported beam and verification of Clark-Maxwell's theorem.
2. To determine the Flexural Rigidity of a given beam.
3. To verify the Moment- area theorem for slope and deflection of a given beam.
4. Deflection of a fixed beam and influence line for reactions.
5. Deflection studies for a continuous beam and influence line for reactions.
6. Study of behavior of columns and struts with different end conditions.
7. Experiment on three-hinged arch.
8. Experiment on two-hinged arch.
9. Deflection of a statically determinate pin jointed truss.
10. Forces in members of redundant frames.
11. Experiment on curved beams.
12. Unsymmetrical bending of a cantilever beam.

**References:**

A Laboratory Manual on Structural Mechanics by Dr. Harwinder Singh; New Academic Publishing Comp. Ltd.