Beant College of Engineering & Technology, Gurdaspur

Scheme and Syllabus
of
B. Tech. Civil Engineering (CE)

Batch 2016 onwards

By
Board of Studies Civil Engineering

Third Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTAM-301	Engineering Mathematics-III	3	1	-	40	60	100	4
BTCE-301	Fluid Mechanics-I	3	1	-	40	60	100	4
BTCE-302	Rock Mechanics & Engineering Geology	3	0	-	40	60	100	3
BTCE-303	Strength of Materials	4	1	-	40	60	100	5
BTCE-304	Surveying	3	1	-	40	60	100	4
BTCE-305	Building Materials & Construction	3	0	-	40	60	100	3
BTCE-306	Fluid Mechanics Lab	-	-	2	30	20	50	1
BTCE-307	Strength of Materials Lab	-	-	2	30	20	50	1
BTCE-308	Surveying Lab	-	-	3	30	20	50	2
BTCE-309	Workshop Training of 4 weeks duration after 2nd semester Carpentry, Electrical, Plumbing, Masonry, CAD				30	20	50	1
	Total	20	04	07	360	440	800	28

Fourth Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTCE-401	Geomatics Engineering	3	1	-	40	60	100	4
BTCE-402	Construction Machinery & Works Management	3	1	-	40	60	100	4
BTCE-403	Design of Concrete Structures-I	4	1	-	40	60	100	5
BTCE-404	Fluid Mechanics-II	3	1	-	40	60	100	4
BTCE-405	Irrigation Engineering-I	3	1	-	40	60	100	4
BTCE-406	Structural Analysis-I	4	1	-	40	60	100	5
BTCE-407	Concrete Technology Lab	-	-	2	30	20	50	1
BTCE-408	Structural Analysis Lab	-	-	2	30	20	50	1
BTCE-409	General Fitness	-	-	-	100	-	100	1
	Total	20	06	04	400	400	800	29

Fifth Semester

Course Code	Course Name	L	T	P	Internal	External	Total Marks	Credits
		Load Allocation			Marks Distribution			
BTCE-501	Design of Steel Structures-I	4	1	-	40	60	100	5
BTCE-502	Geotechnical Engineering	4	1	-	40	60	100	5
BTCE-503	Structural Analysis-II	3	2	-	40	60	100	5
BTCE-504	Transportation Engineering-I	3	1	-	40	60	100	4
BTCE-505	Environmental Engineering –I	3	1	-	40	60	100	4
BTxx-xxx	Open Elective-1	3	0	0	40	60	100	3
BTCE-506	Transportation Engineering Lab	-	-	2	30	20	50	1
BTCE-507	Geotechnical Engineering Lab	-	-	2	30	20	50	1
BTCE-508	Computer Aided Structural Drawing –I	-	-	2	30	20	50	1
BTCE-509	Survey Camp of 04 weeks duration after 4th Semester				100	50	150	2
	Total	**20**	**6**	**6**	**430**	**470**	**900**	**31**

Sixth Semester

Course Code	Course Name	L	T	P	Internal	External	Total Marks	Credits
		Load Allocation			Marks Distribution			
BTCE-601	Design of Concrete Structures-II	4	1	-	40	60	100	5
BTCE-602	Foundation Engineering	4	1	-	40	60	100	5
BTCE-603	Professional Practice	3	2	-	40	60	100	5
BTCE-604	Environment Engineering –II	3	1	-	40	60	100	4
BTxx-xxx	Open Elective –II	3	0	-	40	60	100	3
BTCE-xxx	Departmental Elective -I	3	1	-	40	60	100	3
BTCE-605	Environmental Engineering Lab	-	-	2	30	20	50	1
BTCE-606	Computer Aided Structural Drawing II	-	-	2	30	20	50	1
BTCE-607	General Fitness	-	-	-	100	-	100	1
	Total	**20**	**6**	**4**	**400**	**400**	**800**	**28**

Seventh Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTCE-701	Design of Steel Structures-II	4	1	-	40	60	100	5
BTCE-702	Elements of Earthquake Engineering	3	1	-	40	60	100	4
BTCE-703	Irrigation Engineering-II	3	1	-	40	60	100	4
BTCE-704	Transportation Engineering-II	3	1	-	40	60	100	4
BTCE-xxx	Department Elective-II*	3	0	-	40	60	100	3
BTCE-xxx	Departmental Elective-III*	3	0	-	40	60	100	3
BTCE-705	Project	-	-	6	100	50	150	3
BTCE-706	General Fitness	-	-	-	100	-	100	1
	Total	**19**	**4**	**6**	**440**	**410**	**850**	**27**

* Departmental Elective II and Elective III should not be from the same group

Eighth Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTCE-801	(a) Software Training* Minimum 6 week	-	-	-	150	100	250	10
	(b) Industrial Training Minimum 12 week				300	200	500	20
	Total				450	300	750	30

*Any software that enhances professional capability in Civil Engineering

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Open Elective-I

BTCE-951   Hydrology and Dams

BTCE-952   Traffic Engineering

Open Elective-II

BTCE-961   Building Maintenance and Safety

BTCE-962   Project Monitoring and Management

Departmental Elective-I

BTCE-901   Numerical Methods in Civil Engineering

BTCE-902   Finite Element Methods

Departmental Elective-II

BTCE-903 Disaster Management

BTCE-904 Infrastructure development and Management

Departmental Elective-III

BTCE-905 Ground Improvement Techniques

BTCE-906 Pre-Stressed Concrete

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Third Semester

BCET

BTAM-301 Engineering Mathematics – III

		L	T	P
Internal Marks: 40		**3**	**1**	**0**
External Marks: 60				
Total Marks: 100				

1. Fourier Series:

Periodic functions, Euler's formula. Even and odd functions, half range expansions, Fourier series of different waveforms. (6)

2. Laplace Transforms:

Laplace transforms of various standard functions, properties of Laplace transforms, inverse Laplace transforms, transform of derivatives and integrals, Laplace transform of unit step function, impulse function, periodic functions, applications to solution of ordinary linear differential equations with constant coefficients, and simultaneous differential equation. (8)

3. Special Functions:

Power series solution. of differential equations, Frobeniusmethod, Legendre's equation, Legendre polynomial, Bessel's equation, Bessel functions of the first and second kind. Recurrence relations, equations reducible to Bessel's equation. (8)

4. **Partial Differential Equations:**

Formation of partial differential equations, Linear partial differential equations, homogeneous partial differential equations with constant coefficients, Solution by the method of separation of variables**.**

(8)

5. Functions of Complex Variable:

Limits, continuity and derivative of the function of complex variable, Analytic function, Cauchy- Riemann equations, conjugate functions, harmonic functions; Conformal Mapping: Definition, standard transformations, translation, rotation, inversion, bilinear. **(6)**

Suggested Readings / Books:

1. Kreyszing, E., Advanced Engineering Mathematics, Eighth edition, John Wiley, New Delhi.

2. Grewal, B. S., Higher Engineering Mathematics, Khanna Publishers, New Delhi.

3. Ian N. Sneedon, Elements of Partial Differential Equations, McGraw- Hill, Singapore, 1957.

4. Peter. V. O'Nil, Advanced Engineering Mathematics, Wadsworth Publishing Company.

5. Taneja, H. C., Engineering Mathematics, Volume-I & Volume-II, I. K. Publisher.

6. Babu Ram, Advance Engineering Mathematics, Pearson Education.

7. Bindra, J. S., Applied Mathematics, Volume-III, Kataria Publications.

8. Advanced Engineering Mathematics, O'Neil, Cengage Learning.

BTCE-301 Fluid Mechanics-I

Internal Marks: 40   **L   T   P**
External Marks: 60   **3   1   0**
Total Marks: 100

1. Fluid and Properties

Concept of fluid, difference between solids, liquids and gases, ideal and real fluids, continuum concept of fluid, density, specific weight, relative density, viscosity and its dependence on temperature, surface tension and capillarity, vapor pressure and cavitation, compressibility and bulk modulus, Newtonian and non-Newtonian fluids.   (5)

2. Fluid Statics

Concept of pressure, Pascal's law and hydrostatic paradox, action of fluid pressure on plane (horizontal, vertical and inclined) submerged surface, resultant force and center of pressure, force on a curved surface due to hydrostatic pressure. Buoyancy and flotation, stability of floating and submerged bodies, Meta centric height and its determination.   (6)

3. Fluid Kinematics

Classification of fluid flows, velocity and acceleration of fluid particle, local and convective acceleration, normal & tangential acceleration streamline, pathline and streakline, flow rate and discharge mean velocity continuity equation in Cartesian co-ordinates, rotational flows, rotational velocity and circulation, stream & velocity potential functions.   (6)

4. Fluid Dynamics

Euler's equation, Bernoulli's equation and steady flow energy equation, representation of energy changes in fluid system, impulse momentum equation, kinetic energy and momentum correction factors, flow along a curved streamline, free and forced vortex motions.   (6)

5. Dimensional Analysis and Similitude

Fundamental and derived units and dimensions, dimensional homogeneity, Rayleigh's and Buckingham's Pi method for dimensional analysis, dimension less number and their significance, geometric, kinematic and dynamic similarity, model studies.   (5)

6. Flow Past Immersed Bodies

Drag and lift, deformation drag and pressure drag, drag on a sphere, cylinder and airfoil, Magnus effect and circulation, lift on a circular cylinder.   (6)

7. Flow Measurement

Manometers, Pitot tubes, venturimeter, orifice meters, orifices, mouthpieces, notches (Rectangular and V-notches) and weirs (Sharp crested Weirs).   (4)

Books:

1. Fluid Mechanics & Hydraulic Machines by R.K. Bansal, Luxmi Publications.

2. Fluid mechanics and Fluid Power Engineering by D.S. Kumar, S.K. Kataria and Sons.

3. Hydraulic and Fluid Mechanic by P.N. Modi & S.M. Seth, Rajsons Publications Pvt. Ltd.

4. Engineering Fluid Mechanics by R.J. Garde & A.G. Mirajgaoker.

5. Fluid Mechanics by J. F. Douglas, J.M. Gasiorek, J.P. Swaffield, L.B. Jack, Pitman.

6. Fluid Mechanics: Streetes VL & Wylie EB, Mcgraw Hill book company.

7. Introduction to Fluid Mechanics by Robert W. Fox & Alan T. McDonald.

8. Fluid Mechanics by Potter, Cengage Learning.

BTCE-302 Rock Mechanics & Engineering Geology

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

1. General Geology

Importance of engineering geology applied to civil engineering practices, weathering, definition, types and effect, geological works of rivers, wind, glaciers as agents of erosion, transportation and deposition.

(7)

2. Rocks & Minerals

Minerals, their identification, igneous, sedimentary & metamorphic rocks, classification of rocks for engineering purposes, rock quality designation (RQD). (6)

3. Structural Geology

Brief idea about stratification, apparent dip, true dip, strike and inconformities, folds. Faults & joints: definition, classification relation to engineering operations. (5)

4. Engineering Geology

Geological considerations in the engineering projects like tunnels, highways, dams, reservoirs, foundation. Earthquake: Definition, terminology, earthquake waves, intensity, recording of earthquake.

(5)

5. Engineering Properties of Rocks and Laboratory Measurement

Uniaxial compression test, tensile test, permeability test, shear test, size and shape of specimen. Confining pressure, stress strain curves of typical rocks strength of intact and fissured rocks, effect of anisotropy, effect of saturation and temperature. (5)

6. In-situ determination of Engineering Properties of Rocks

Necessity of in-situ tests, uniaxial load tests in tunnels and open excavations, cable test, flat jack test, shear test, pressure tunnel test. Simple methods of determining in situ stresses, bore hole test. (6)

7. Improvement in Properties of Rocks

Pressure grouting for dams and tunnels, rock reinforcement rock bolting. (6)

Books:

1. Introduction to Rock Mechanics: Richard E. Goodman.

2. Engineering Behaviour of rocks: Farmar, I.W.

3. Rock Mechanics and Engineering: Jaager C.

4. Fundamentals of Rock Mechanics: Jaager and Cook.

5. Engineering Geology: D.S.Arora.

6. Engineering Geology: Parbin Singh.

7. Rock Mechanics for Engineering: B.P. Verma.

BTCE-303 Strength of Material

			L	T	P
Internal Marks:	40		**4**	**1**	**0**
External Marks:	60				
Total Marks:	100				

1. Concept of Equilibrium

Load, reaction & support, general equilibrium equations, equilibrium of a point in space, equilibrium of a member, concept of free body diagrams, displacements, concept of statical-determinacy and indeterminacy**.** (5)

2. Simple Stress and Strains

Introduction, concept of stress and strain, generalized Hooke's law, stress-strain diagram of ductile and brittle materials, compound and composite bars, thermal stresses. Elastic constants, relations between various elastic constants, lateral strain, volumetric strain, poisons ratio, stress and strains in thin cylinders, spherical shells and thin vessels subjected to internal pressures. (8)

3. Complex Stress and Strains

Introduction, Normal stress, tangential stress, Rectangular block subjected to normal stress along and across two planes, combination of normal and tangential stress, Concept of principal stress and its computation, Mohr circle, Principal strains, computation of principal stresses from the principal strains.

(6)

4. Shear Force and Bending Moment Diagrams

Introduction to the concept of reaction diagrams, shear force and bending moment, role of sign conventions, types of load, shear force and bending moment diagrams for simply supported, overhang and cantilever beams subjected to any combination of point loads, uniformly distributed, varying load and moment, relationship between load, shear force and bending moment. (8)

5. Bending and Shear Stresses

Introduction, assumptions and derivation of flexural formula for straight beams, centroid of simple and built up section, second moment of area, bending stress diagrams for beams of simple and built up section, composite sections (flitched sections), and shear stress. (5)

6. Columns and Struts

Stability of columns, buckling load of an axially loaded columns with various end conditions, Euler's and Rankine's formula, columns under eccentric load. (4)

7. Torsion of Circular Shafts

Torsion, basic assumptions, derivation of torsion equation, Power transmitted by shafts, analysis and design of solid and Hollow shafts based on strength and stiffness, Sections under combined bending and torsion, equivalent bending and torsion. (6)

8. Failure Theories

Maximum principal stress theory, maximum shear stress theory, distortion energy theory, strain energy theory. (4)

Books:

1. D.S. Bedi, Strength of Materials, Khanna Book Publishing Company.

2. E.P. Popov, Mechanics of Materials-(SI Version), Prentice Hall India.

3. R.S Lehri and A.S. Lehri, Strength of Materials, Kataria and Sons.

4. S.S.Rattan, Strength of Materials, Tata McGraw Hill.

5. Timoshenko and Young, Elements of Strength of Materials, East West Press (EWP).

6. James M Gere and Barry J. Goodno, Strength of Materials, Cengage Learning.

7. James M Gere, Mechanics of Materials, Thomson Brooks/Cole/Pearson, 2006.

8. R.C. Hibbeler, Mechanics of Materials, 6th Edition, Pearson Education, 2007.

BTCE-304 Surveying

			L	T	P
Internal Marks:	40				
External Marks:	60		3	1	0
Total Marks:	100				

1. Introduction
Definition, principles of surveying, different types of surveys, topographical map, scale of map. (3)

2. Chain and Compass Surveying
Direct & indirect ranging measurement of distances with chain and tape, offsets, chain tape corrections, types of bearing and measurement, calculation of angles from bearings. (6)

3. Plane Table Surveying
Setting up the plane table and methods of plane tabling. (4)

4. Leveling and Contouring
Setting up a dumpy level, methods of levelling, finding levels by rise & fall method and height of instrument method, corrections due to curvature and refraction. Characteristics of contours, methods of contouring, uses of contour maps. (4)

5. Theodolite Traversing
Temporary and permanent adjustments, measurement of horizontal and vertical angles, adjustment of closing error by Bowditch & Transit rules. (4)

6. Tachometry
Definition, determination of tachometer constants and reduced level from tachometric observations. (6)

7. Triangulation
Selection of stations and base line, corrections for base line, satellite station, use of total station for surveying. (6)

8. Curves
Different types of curves and their use. Elements of a simple, circular curve. Different methods of setting out of these curves. (6)

Books:

1. Duggal, S.K., Surveying Vol I & II, Tata McGraw Hill (2006).

2. Punmia, B.C., Jain, Ashok Kumar and Jain, Arun Kumar, Surveying Vol. I and II, Laxmi Publications (2005).

3. Agor, R., Surveying, Khanna Publishers (1982).

4. Bhavikatti,S.S. Surveying & Levelling Volume I&II (2009).

BTCE-305 Building Material & Construction

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

L   T   P
3   0   0

1. Building Stones & Bricks

Characteristics of a good building stone, Deterioration and preservation of stones, Artificial gtones, Composition of good brick earth, Qualities of good bricks, Classification of bricks, Tests on bricks, Varieties of fire bricks.   (3)

2. Cement

Types, uses and composition of cement, raw materials, manufacturing process, varieties and properties of cement, hydration of cement, testing of cement.   (3)

3. Concrete

Introduction, constituents of concrete, batching of materials, manufacturing process of cement concrete, workability and factors affecting it, use of different waste materials in concrete, methods to determine workability, segregation and bleeding of concrete, strength of concrete and factors affecting it.   (5)

4. Timber

Structure of a tree, classification of trees, qualities of good timber, defects in timber, seasoning of timber, decay of timber, preservation of timber.   (3)

5. Miscellaneous Materials

Use of Aluminium, Glass, Plastics etc.in construction.   (2)

6. Foundation and Walls

Definition, types of foundation, causes of failures of foundation and remedial measures, types of wall and thickness considerations.   (3)

7. Brick and Stone Masonry

Types of bond & their merits and demerits. Rubble and ashlar joints in stone masonry. Cement concrete hollow blocks and their advantages and disadvantage.   (3)

8. Damp Proofing

Causes of dampness, preventive measures for dampness in buildings.   (2)

9. Roofs

Classification of roofs and roof trusses, members of roof trusses different roof covering materials.

(2)

10. Plastering and Pointing

Advantages of plastering and painting, methods of plastering, materials and types, defects in plastering, different types of finishing plastered surface.   (3)

11. Floors

Types of floors used in building & and their suitability, factors for selecting suitable floor for building.

(3)

12. Miscellaneous Topics

Building services – Plumbing, Electrical, Air conditioning, Accoustics & sound insulation, Fire protection measures, Lift. (4)

Books:

1. Rangwala – Building materials.

2. Bindra SP, Arora KR Building construction.

3. Shetty MS, Concrete Technology.

4. Punmia BC, Building construction.

5. Singh, Parbin, Building materials.

6. Sushil Kumar, Building Construction.

BTCE-306 Fluid Mechanics Lab

Internal Marks: 30   **L   T   P**
External Marks: 20   **0   0   2**
Total Marks: 50

1. To determine the meta-centric height of a floating vessel under loaded and unloaded conditions.

2. To study the flow through a variable area duct and verify Bernoulii's energy equation.

3. To determine the coefficient of discharge for an obstruction flow meter (venturimeter/orifice meter).

4. To determine the discharge coefficient for a Vee notch or rectangular notch.

5. To determine the coefficient of discharge for Broad crested weir.

6. To determine the hydraulic coefficients for flow through an orifice.

7. To determine the friction coefficient for pipes of different diameter.

8. To determine the head loss in a pipe line due to sudden expansion / sudden contraction/ bend.

9. To determine the velocity distribution for pipe line flow with a pitot static probe.

BTCE-307 Strength of Material Lab

				L	T	P
Internal Marks:	30			0	0	2
External Marks:	20					
Total Marks:	50					

1. To draw Stress Strain curve for Ductile and Brittle material in tension.

2. To draw Stress Strain curve for Ductile and Brittle material in compression.

3. To draw shear stress, shear strain curve for ductile and brittle material in torsion strength testing

4. To draw load deflection curve for spring in loading and unloading conditions.

5. To determine the hardness of the given material by Rockwell and Brinell hardness testing machine.

6. To determine the fatigue strength of the material.

7. To determine the impact strength by Izod and Charpy test.

8. To determine the flexural strength of timber/steel beam.

BTCE-308 Surveying Lab

		L	T	P
Internal Marks: 30		0	0	3
External Marks: 20				
Total Marks: 50				

1. Measurement of distance, ranging a line.

2. Measurement of bearing and angles with compass, adjustment of traverse by graphical method.

3. Determination of level by height of instrument, rise & fall methods.

4. Measurement of horizontal and vertical angle by theodolite.

5. Determination of tachometric constants and determination of reduced levels by tachometric observations.

6. Plane table survey, different methods of plotting - two point & three-point problem.

7. Determination of height of an inaccessible object.

8. Setting out a transition curve. Setting out of circular curves in the field using different methods.

BTCE-309 Workshop Training

				L	T	P
Internal Marks:	30					
External Marks:	20			-	-	-
Total Marks:	50					

This will be held after 2nd Semester during summer in the Institute Workshop for four weeks daily for 4 hrs. The students will be trained in the area of Carpentry, Electrical, Plumbing, Masonary and CAD work.

Beant College of Engineering & Technology, Gurdaspur

BCET

Fourth Semester

BTCE-401 Geomatics Engineering

Internal Marks:	40	L	T	P
External Marks:	60	3	1	0
Total Marks:	100			

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, introduction of electronic total station & their applications.

(9)

2. 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 – geo-stationary and sun-synchronous, earth resources satellites, meteorological satellites, sensors, types and their characteristics, across track and along track scanning, applications of remote sensing.   (9)

3. 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.   (9)

4. 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, customized local reference ellipsoids, national reference systems, worldwide reference ellipsoid, WGS 84, differential-GPS, classification of GPS receivers, GPS applications.   (9)

Books:

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 McGraw Hill.

4. Heywood. I, Cornelius S, Crver Steve. 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 and Works Management

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

L	T	P
3	1	0

1. Introduction
Need for project planning & management, time, activity & event, bar chart, Milestone chart, uses & draw backs. (4)

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, probability of achieving scheduled project. (10)

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. (6)

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. (8)

5. Construction Equipment and Machinery
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- Hoists, Winches, Cranes, Belt conveyors, Ropeways, trucks & Wagons, Construction Equipments, concrete pumps, Working flow diagram of RMC Plant, Bituminous Plant , Paver Plant. (6)

6. Software
Introduction of relevant software. (2)

Books:

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

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

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

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

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

BTCE-403 Design of Concrete Structures-I

			L	T	P
Internal Marks: 40
External Marks: 60
Total Marks: 100

L T P
4 1 0

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

Part A: CONCRETE TECHNOLOGY

1. Concretes & Admixtures
Various ingredients of concrete and their properties. Various types of admixtures and their uses. (5)

2. Properties of Concrete
Different properties of fresh and hardened concrete and their testing procedure. (5)

3. Mix Design
Concrete mix design as per IS method. Factors affecting strength and durability of concrete and acceptance criteria. (7)

Part B: DESIGN OF REINFORCED CONCRETE ELEMENTS

I. Concept and Methods of Structural Design, Objectives, Properties of Concrete and Steel, Stress-Strain behavior of Steel and Concrete. (5)

II. Design Philosophies: Working Stress Method, Limit State Method. (5)

III. Analysis & Design of Simply Supported Beams – (Rectangular and Flanged Sections). (7)

IV. Analysis & Design for Shear, Bond, Anchorage, Development Length and Torsion. (7)

V. Analysis & Design of One and Two way Slabs, Stairs. (7)

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

L	T	P
3	1	0

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. (7)

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.(7)

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)

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 rectangular, trapezoidal and circular flow sections. (5)

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. (4)

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)

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. (5)

Books:

1. Hydraulics & Fluid Mechanics by P.N. Modi and S.M. Seth; Standard Publication

2. Flow in Open Channels by K. Subraminayam; Tata MacGraw Hill

3. Introduction to Fluid Mechanics by Robert N. Fox & Alan T.Macnold

4. Fluid Mechanics : R.K. Bansal; Laxmi Publications

5. Fluid Mechanics : Jagdish Lal; Metropolitan Book Co. (P) Ltd.

BTCE-405 Irrigation Engineering–I

Internal Marks: 40	**L T P**
External Marks: 60	**3 1 0**
Total Marks: 100	

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.   (5)

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.   (4)

3. Canal Irrigation
Classifications of canals, canal alignment, Inundation canals, Bandhara irrigation, advantages and disadvantages, 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.   (5)

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.   (4)

5. Losses in Canals, Water Logging and Drainage
Losses in canals-evaporation and seepage, water logging, causes and ill effects of water logging anti water logging measures. Drainage of land, classification of drains - surface and subsurface drains, Design considerations for surface drains, advantages and maintenance of tile drains.   (4)

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, planning of an irrigation project, economics & financing of irrigation works. Documentation of project report.   (6)

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 tube wells, optimum capacity, duty and delta of a tube well. Rehabilitation of tube well.

(6)

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. (6)

Books:

1. Principles & practice of Irrigation Engineering S.K.Sharma, S. Chand, Limited.

2. Irrigation & Water Power Engineering B.C. Punmia, Pande B.B.Lal, Laxmi Publications (P) Ltd

3. Fundamentals of Irrigation Engineering Dr. Bharat Singh, Nem Chand & Bros

4. Irrigation Engineering & Hydraulic Structure S.R.Sahasrabudhe, S. K. Kataria & Sons

5. Irrigation Engineering & Hydraulic Structure Varshney, Gupta & Gupta, Nem Chand and Brothers

6. Irrigation Engineering & Hydraulic Structure Santosh Kumar Garg, Khanna Publishers

BTCE-406 Structural Analysis- I

				L	T	P
Internal Marks:	40					
External Marks:	60			**4**	**1**	**0**
Total Marks:	100					

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

I.   Geometric Methods: Double integration; Macaulay's method; Moment area method; Conjugate beam method.

II. 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. (12)

2. Determinate Structures
Concept of determinacy; analysis of determinate structural elements—truss, arch, beam, frame, cables; internal forces in determinate structures; determinate reaction diagram-- bending moment, shear force, radial shear, normal thrust diagrams for the determinate structures.

I.   Analysis of plane trusses, compound and complex trusses using method of joints, method of sections, tension coefficients.

II. Analysis of three-hinged arch of various shapes under different loading conditions.

III. Analysis of simple portal frame, cables under different loading conditions.

(12)

3. 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 different structural parameters in beams; 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. (10)

4. Analysis of Cables and Suspension Bridges
General cable theorem, analysis of cables supported at same or different levels, shape, elastic stretch of cable, maximum tension in cable and back-stays, pressure on supporting towers, suspension bridges, three hinged stiffening girders. (8)

5. 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.. (6)

Books:

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

L   T   P
0   0   2

1. To determine the specific gravity 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 using cube and cylinder.

7. To carry out the split tensile and flexural strength of concrete.

8. Compressive strength of brick and tile as per 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

				L	T	P
Internal Marks:	30					
External Marks:	20			0	0	2
Total Marks:	50					

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.

Books/Manuals

A Laboratory Manual on Structural Mechanics by Dr. Harvinder Singh, New Academic Publishing Comp. Ltd.

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BCET

Fifth Semester

BTCE 501 Design of Steel Structures – I

	L	T	P
Internal Marks: 40			
External Marks: 60	**4**	**1**	**0**
Total Marks: 100			

Note: Relevant Indian Codes of Practice are permitted in Examination.

1. Introduction
Properties of structural steel, I.S. rolled sections, I.S. specifications.   (4)

2. Connections
Riveted, bolted and welded connections for axial and eccentric loads.   (5)

3. Tension members
Design of members subjected to axial tension.   (5)

4. Compression members
Design of axially loaded members, built-up columns, laced and battened columns including the design of lacing and battens.   (5)

5. Flexural members
Design of laterally restrained and un-restrained rolled and built-up sections, encased beams.   (5)

6. Column bases
Design of slab base, gusseted base and grillage foundation.   (6)

7. Roof truss
Design loads, combination of loads, design of members (including purlins) and joints, detailed working drawings.   (6)

Books & Codes:

1) Limit state design of steel structures: S K Duggal, Mc Graw Hill
2) Design of steel structures: N Subramanian Oxford Higher Education
3) Design of steel structures (Vol. 1): Ram Chandra Standard Book House - Rajsons
4) Design of steel structures (by limit state method as per IS: 800-2007): S S Bhavikatti *I* K International Publishing House
5) IS 800: 2007 (General construction in steel-Code of practice)*
6) SP: 6(1) (Handbook for structural engineers-Structural steel sections)*

* permitted in Examination

BTCE-502 Geotechnical Engineering

				L	T	P
Internal Marks:	40			4	1	0
External Marks:	60					
Total Marks:	100					

1. Basic Concepts

Definition of soil and soil mechanics, common soil mechanics problems in Civil Engineering. Principal types of soils. Important properties of very fine soil. Characteristics of main Clay mineral groups. Weight volume relationship and determination of specific gravity from pycnometer test. Field density from sand replacement method and other methods.   (4)

2. Index Properties

Grain size analysis. Stokes's law and Hydrometer analysis. Consistency and sensitivity of Clay, Atterbeg Limits, Flow Index and Toughness Index. Underlying theory of shrinkage limit determination. Classification of coarse and fine-grained soils as per Indian Standard.   (6)

3. Compaction

Definition and object of compaction and concept of O.M.C. and zero Air Void Line.Modified proctor Test. Factors affecting compaction Effect of compaction on soil properties and their discussion. Field compaction methods- their comparison of performance and relative suitability. Field compacative effort, Field control of compaction by proctor.   (6)

4. Consolidation

Definition and object of consolidation, Difference between compaction and consolidation. Concept of various consolidation characteristics i.e. av, mv and cv, primary and secondary consolidation. Terzaghi's Differential equation and its derivation. Boundary conditions for Terzaghi's solution for one dimensional consolidation concept of cv, tv & U. Consolidation test determination of cv from curve fitting methods, consolidation pressure determination. Normally consolidated and over consolidated clays. Causes of over-consolidation. Effect of disturbance on e-Logσ curves of normally consolidated clays, importance of consolidation settlement in the design of structures.   (8)

5. Permeability and Seepage

Concept of effective stress principal, seepage pressure, critical hydraulic gradient and quick sand condition. Capillary phenomenon in soil. Darcy's Law and its validity, seepage velocity, co-efficient of permeability (k) and its determination in the laboratory. Average permeability of startified soil mass, factors affecting 'k' and brief discussion.   (6)

6. Shear Strength

Stress analysis of a two dimensional stress system by Mohr circle. Concept of pole. Coulomb's law of shear strength coulomb - Mohr strength theory. Relation between principal stesses at failure. Direct, triaxial and unconfined shear strength tests. Triaxial shear tests based on drainage conditions typical strength envelopes for clay obtained from these tests. Derivation of skempton's pore pressure parameters. Stress strain and volume change characteristics of sands.   (6)

7. Stability of Slopes

Slope failure, base failure and toe failure - Swedish circle method - $\varphi=0$ analysis and $c=0$ analysis - friction circle method - Taylor's stability number - stability charts - sliding block analysis. **(5)**

Books:

1. Soil Mech. & Foundation Engg, by K.R.Arora Standard *Publishers* Distributors
2. Geotechnical Engineering, by P. Purshotama Raj *Tata Mcgraw Hill*
3. Soil Mech. & Foundation Engg., by V.N.S.Murthy CBS *Publishers* & Distributors.
4. Principle of Geotechnical Engineering by B.M.Das Cengage Publisher
5. Basic and applied Soil Mechanics by Gopal Ranjan and A.S.R.Rao New Age International Publishers
6. Geotechnical Engineering by Gulati and Datta, Tata McGraw Hill
7. Problems in Soil mechanics and Foundation Engineering by B.P.Verma, Khanna Publishers.

BTCE-503 Structural Analysis-II

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

1. Indeterminate Structures

Concept of indeterminate /redundant structures; Static and kinematic indeterminacies; stability of structures; internal forces; Conditions of stress-strain relationships, equilibrium and compatibility of displacements. **(6)**

2. Indeterminate Structural Systems

Pin-jointed and rigid-jointed structural systems; Deformation of redundant structures-sway and non-sway frames, elastic curve; Static equilibrium and deformation compatibility checks; Effects of support settlement and lack of fit; Fixed-end moments—member loading, sinking of supports, temperature; Analysis of redundant beams, frames, trusses, arches using following methods:

a) Conventional Methods

Slope deflection method; Moment distribution method; Rotation contribution method (Kani's Method).

b) Classical Methods

Methods of consistent deformation; Theorem of three moments.

c) Approximate Methods

Portal method; Cantilever method; Substitute frame method. **(14)**

3. Influence Line Diagrams

Concept and application in the analysis of statically indeterminate structures; Influence line for bar forces in the statically indeterminate trusses, beams and frames. **(10)**

Books:

1. Basic structural analysis - C.S. Reddy Tata McGraw-Hill
2. Intermediate structural analysis - C . K. Wang. McGraw Hill
3. Indeterminate structural analysis - J. Sterling Kinney Addison-Wesley Educational Publishers
4. Theory of structures - B.C. Punima, Laxmi Publications
5. Structural Analysis, Devdas Menon, Narosa Publishers.

BTCE-504 Transportation Engineering – I

	L	T	P
Internal Marks: 40			
External Marks: 60	3	1	0
Total Marks: 100			

1. Introduction
Importance of Transportation, Different Modes of Transportation, Characteristics of Road Transport.

(3)

2. Highway Development & Planning
Principles of Highway Planning, Road Development in India, Classification of Roads, Road Patterns, Planning Surveys. **(3)**

3. Highway Alignment
Requirements, Alignment of Hill Roads, Engineering Surveys. **(3)**

4. Highway Geometric Design
Cross Section Elements, Carriageway, Camber, Sight Distances, Horizontal Curves, Extra-widening, Super-elevation, Vertical Curves. **(3)**

5. Highway Materials
Properties of Sub-grade and Pavement Component Materials, Tests on Sub-grade Soil, Aggregates and Bituminous Materials. **(4)**

6. Highway Construction
Earthen/Gravel Road, Water Bound Macadam, Wet Mix Macadam, Bituminous Pavements, Cement Concrete Pavements. **(3)**

7. Highway Drainage and Maintenance
Importance of drainage and maintenance, Surface Drainage and Subsoil Drainage, Construction in Water-logged areas, Pavement Failures, Pavement Evaluation, Maintenance and Strengthening Measures.

(4)

8. Design of flexible Pavements
Methods for design of pavements **(3)**

9. Traffic Characteristics
Road User Characteristics, Driver Characteristics, Vehicular Characteristics. **(3)**

10. Traffic Studies
Volume Studies, Speed Studies, O-D Survey, Parking Study. **(3)**

11. Traffic Safety and Control Measures
Traffic Signs, Markings, Islands, Signals, Cause and Type of Accidents, Use of Intelligent Transport System. **(3)**

12. Traffic Environment Interaction
Noise Pollution, Vehicular Emission, Pollution Mitigation Measures. **(3)**

Books:

1. Khanna S.K., and Justo, C.E.G. "Highway Engineering", Nem Chand and Brothers, Roorkee, 1998.
2. Kadiyali, L.R. "Principles and Practice of Highway Engineering", Khanna Publishers, New Delhi, 1997.
3. Flaherty, C.A.O. "Highway Engineering", Volume 2, Edward Arnold, London, 1986.
4. Sharma, S.K. "Principles, Practice & Design of Highway Engineering", S. Chand & Company Ltd., New Delhi, 1985.
5. Mannering, "Principles of Highway Engineering & Traffic Analysis", Wiley Publishers, New Delhi.

BTCE-505 Environmental Engineering – I

		L	T	P
Internal Marks:	40			
External Marks:	60	3	1	0
Total Marks:	100			

1. Introduction
Beneficial uses of water, water demand, per capita demand, variations in demand, water demand for fire fighting, population forecasting and water demand estimation.   **(5)**

2. Water sources and development
Surface and ground water sources; Selection and development of sources; Assessment of potential; Flow measurement in closed pipes, intakes and transmission systems.   **(6)**

3. Pumps and pumping stations
Types of pumps and their characteristics and efficiencies; Pump operating curves and selection of pumps; pumping stations.   **(5)**

4. Quality and Examination of Water
Impurities in water, sampling of water, physical, chemical and bacteriological water quality parameters, drinking water quality standards and criteria.   **(6)**

5. Water treatment
Water treatment schemes; Basic principles of water treatment; Design of plain sedimentation, coagulation and flocculation, filtration – slow, rapid and pressure; Disinfection units; Fundamentals of water softening, fluoridation and de-fluoridation, and water desalination and demineralization, taste and odour removal.

(7)

6. Transportation of Water
Pipes for transporting water and their design, water distribution systems and appurtenances; Water supply network design and design of balancing and service reservoirs; operation and maintenance of water supply systems.   **(6)**

7. Rural water supply
Principles, selection of source, rain water harvesting, quantitative requirements, low cost treatment techniques.   **(6)**

Books:

1. Water Supply Engineering- Environmental Engg. (Vol.–I) by B.C. Punmia, Ashok Jain, Arun 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. "Environmental Engg." By Howard S. Peavy, Donald R. Rowe & George Tchobanoglous, McGraw Hill, International Edition
4. Water Supply Engineering- Environmental Engg. (Vol. – I) by S.K. Garg, Khanna Publishers, Delhi.
5. Water Supply and Sewerage by Steel EW and McGhee, Terence J.; McGraw Hill.

BTCE-506 Transportation Engineering Lab

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

L	T	P
0	0	2

I Tests on Sub-grade Soil
1. California Bearing Ratio Test

II Tests on Road Aggregates
2. Crushing Value Test
3. Los Angles Abrasion Value Test
4. Impact Value Test
5. Shape Test (Flakiness and Elongation Index)

III Tests on Bituminous Materials and Mixes
6. Penetration Test
7. Ductility Test
8. Softening Point Test
9. Flash & Fire Point Test
10. Bitumen Extraction Test

IV Field Tests
11. Roughness Measurements Test by Roughometer
12. Benkelman Beam Pavement Deflection Test

Books/Manuals:
1.Khanna S.K., and Justo, C.E.G. "Highway Material & Pavement Testing", Nem Chand and Brothers, Roorkee.

BTCE-507 Geotechnical Engineering Lab

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

L T P
0 0 2

1. Determination of in-situ density by core cutter method and Sand replacement method.

2. Determination of Liquid Limit & Plastic Limit.

3. Determination of specific gravity of soil solids by pyconometer method.

4. Grain size analysis of sand and determination of uniformity coefficient (Cu) and coefficient of curvature (Cc).

5. Compaction test of soil.

6. Determination of Relative Density of soil.

7. Determination of permeability by Constant Head Method.

8. Determination of permeability by Variable Head method.

9. Unconfined Compression Test for fine-grained soil.

10. Direct Shear Test

11. Tri-axial Test

12. Swell Pressure Test

Books:

1. Soil Testing Engineering, Manual By Shamsher Prakash and P.K. Jain. Nem Chand & Brothers

BTCE-508 Computer Aided Structural Drawing

Internal Marks: 30   **L   T   P**
External Marks: 20   **0   0   2**
Total Marks: 50

1. Structural Drawings of Reinforced Concrete Elements such as Beams, Slabs.
2. Structural Drawings of Steel Elements such as Connections, Tension Members, Compression Members, Beams, Column Bas0e, and Roof Trusses.

BTCE-509 Survey Camp

Internal Marks: 100
External Marks: 50
Total Marks: 150

Survey Camp of four weeks duration will be held immediately after IVth semester examination at a Hilly Terrain. The students are required to prepare the Topographical Map of the area by traditional method. Students should also be exposed to modern Survey Equipment and practices, like Total Station, Automatic Level, GPS etc.

Beant College of Engineering & Technology, Gurdaspur

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BCET

Sixth Semester

BTCE-601 Design of Concrete Structures-II

		L	T	P
Internal Marks: 40				
External Marks: 60		4	1	0
Total Marks: 100				

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.   **(5)**

2. Foundations
Theory and Design: Isolated Footing (Square, Rectangular), Combined Footing (Rectangular, Trapezoidal, Strap), Raft Footing.   **(6)**

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.   **(9)**

4. Design of Continuous beams and curved beam.   **(5)**

5. Design of Domes.   **(4)**

6. Design of Retaining walls
Cantilever type retaining wall, Counterfort type retaining wall.   **(5)**

7. Introduction to water retaining structures
Design of circular and rectangular water tanks resting on ground.   **(6)**

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 Foundation Engineering

			L	T	P
Internal Marks:	40				
External Marks:	60		4	1	0
Total Marks:	100				

1. 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. **(7)**

2. 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, Ka and Kp 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).

(8)

3. 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. Skemptons 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. **(8)**

4. 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.

(8)

5. 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. **(7)**

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-603 Professional Practice

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

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. **(5)**

2. Schedule of Rates, analysis of rates

For earthwork, concrete work, D.P.C., stone masonry, plastering, pointing, roadwork. **(6)**

3. Specifications

For different classes of building and Civil engineering works. **(5)**

4. Rules and measurements for different types of Civil engineering works. **(4)**

5. Types of contracts

Tenders, tender form, submission and opening of tenders, measurement book, muster roll , piecework agreement and work order. **(5)**

6. Accounts

Division of accounts, cash, receipt of money, cash book, temporary advance,imprest, accounting procedure. **(4)**

7. Arbitration

Acts and legal decision-making process. **(4)**

Books:

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-604 Environmental Engineering – II

			L	T	P
Internal Marks:	40		**3**	**1**	**0**
External Marks:	60				
Total Marks:	100				

1. Introduction
Terms & definitions, systems of sanitation and their merits and demerits, system of sewerage, choice of sewerage system and suitability to Indian conditions. **(3)**

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. **(5)**

3. House Drainage
Principles of house drainage, traps, sanitary fittings, system of plumbing, drainage lay out for residences. **(5)**

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. **(4)**

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. **(5)**

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. **(4)**

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. **(4)**

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 -605 Environmental Engineering Laboratory

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

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:

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-606 Computer Aided Structural Drawing – II

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

1. Structural Drawings of Reinforced Concrete Elements as per BTCE-601

BCET

Beant College of Engineering & Technology, Gurdaspur

Seventh Semester

BTCE 701 Design of Steel Structures – II

	L	T	P
Internal Marks: 40			
External Marks: 60	4	1	0
Total Marks: 100			

Note: Use of relevant Indian Standards is allowed.

1. Elements of a plate girder, design of a plate girder, curtailment of flanges, various type of stiffeners.
(8)

2. Design of steel footbridge with parallel booms and carrying wooden decking, using welded joints.
(8)

3. Complete design of an industrial shed including:
    i)   Gantry girder
    ii)   Column bracket
    iii)   Mill bent with constant moment of inertia
    iv)   Lateral and longitudinal bracing for column bent   **(12)**

4. Design of single-track railway bridge with lattice girders having parallel chords (for B.G.)
    i)   Stringer
    ii)   Cross girder
    iii)   Main girders with welded joints
    iv)   Portal sway bracings
    v)   Bearing rocker and rollers   **(12)**

Books & Codes Recommended:

1. Limit state design of steel structures: S K Duggal
2. Design of steel structures: N Subramanian
3. Design of steel structures (Vol. 2): Ram Chandra
4. Design of steel structures: L S Negi
5. Design of steel structures (by limit state method as per IS: 800-2007): S S Bhavikatti
6. IS 800: 2007 (General construction in steel-Code of practice)*
7. SP: 6(1) (Handbook for structural engineers-Structural steel sections)* * permitted in Examination

BTCE-702 Elements of Earthquake Engineering

	L T P
Internal Marks: 40	
External Marks: 60	**3 1 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. Past Earthquakes and Lessons learnt, Various Types of Damages to Buildings. (6)

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. (8)

4. **Lateral Force analysis**, Floor Diaphragm action, moment resisting frames, shear walls. (5)

5. **Concepts of seismic design**, Lateral Strength, Stiffness, ductility and structural configuration. (5)

6. **Introduction to provisions of IS 1893-2002 Part-I for buildings**. Estimation of lateral forces due to earthquake. (4)

7. **Introduction to provisions of IS 4326. 8**. Introduction to provision of IS 13920. (3)

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-703 Irrigation Engineering-II

Internal Marks: 40		**L T P**
External Marks: 60		**3 1 0**
Total Marks: 100		

1. Head Works: Types of head works, Functions and investigations of a diversion Head work: component parts of a diversion head work and their design considerations, silt control devices.   (4)

2. Theories of Seepage: Seepage force and exit gradient, assumptions and salient features of Bligh's Creep theory, Limitations of Bligh's Creep theory, salient features of Lane's weighted Creep theory and Khosla's theory, Comparison of Bligh's Creep theory and Khosla's theory, Determination of uplift pressures and floor thickness.   (6)

3. Design of Weirs: Weirs versus barrage, types of weirs, main components of weir, causes of failure of weir and design considerations with respect to surface flow, hydraulic jump and seepage flow. Design of barrage or weir.   (6)

4. Energy Dissipation Devices: Use of hydraulic jump in energy dissipation, Factors affecting design, Types of energy dissipaters and their hydraulic design.   (4)

5. Canal Regulators: Offtake alignment, cross-regulators – their functions and design, Distributary head regulators, their design, canal escape.   (4)

6. Canal Falls: Necessity and location, types of falls and their description, selection of type of falls, Principles of design, Design of Sarda type, straight glacis and Inglis or baffle wall falls.   (4)

7. Cross-Drainage works: Definitions, choice of type, Hydraulic design consideration, Aqueducts their types and design, siphon aqueducts – their types and design considerations, super passages, canal siphons and level crossing.   (3)

8. Canal Out-lets: essential requirements, classifications, criteria for outlet behaviors, flexibility, proportionality, sensitivity, sensitiveness, etc. Details and design of non-modular, semi-modular and modular outlets.   (3)

Books:

1. Irrigation Engg. & Hydraulic Structure by Santosh Kumar Garg, Khanna Publishers
2. Design of Irrigation Structures by R.K. Sharma, Oxford IBH Pub
3. Irrigation Engg. and Hydraulics Structures by S.R. Sahasrabudhe, . Katson Publishing
4. Irrigation Practice and Design Vol. I to VII by K.B. Khushlani. Oxford IBH Pub
5. P.N. Modi; Irrigation with Resources and with Power Engineering, Standard Book House
6. Irrigation Engg. Vol. I & II by Ivan E. Houk, John Wiley and sons

BTCE-704 Transportation Engineering – II

	L T P
Internal Marks: 40	
External Marks: 60	**3 1 0**
Total Marks: 100	

Railway Engineering

1. **Introduction to Railway Engineering**: History of Railways, Development of Indian Railway, Organisation of Indian Railway, Important Statistics of Indian Railways. Railway Gauges: Definition, Gauges on World Railways, Choice of Gauge, Uniformity of Gauge, Loading Gauge, Construction Gauge**.**
(5)

2. **Railway Track**: Requirements of a Good Track, Track Specifications on Indian Railways, Detailed Cross-Section of Single/Double Track on Indian Railways. Components of Railway Track: Rails, Sleepers, Ballast, Subgrade and Formation, Track Fixtures & Fastenings, Coning of Wheels, Tilting of Rails, Adzing of Sleepers, Rail Joints, Creep of Rails. **(4)**

3. **Geometric Design of Railway Track**: Alignment, Gradients, Horizontal Curve, Superelevation, Equilibrium Cant, Cant Deficiency, Transition Curves. **(2)**

4. **Points and Crossings**: Functions, Working of Turnout, Various types of Track Junctions and their layouts, Level crossing. **(2)**

5. **Railway Stations & Yards**: Site Selection, Classification & Layout of Stations, Marshalling Yard, Locomotive Yard, Equipment at Railway Stations & Yards **(2)**

6. **Signalling and Interlocking**: Objectives, Classification of Signals, Types of Signals in Stations and Yards, Automatic Signalling, Principal of Interlocking. **(3)**

7. **Modernization of Railway Tracks**: High Speed Tracks, Improvement in existing track for high speed, Ballastless Track, MAGLEV, TACV Track. **(2)**

Airport Engineering

8. **Introduction to Airport Engineering**: Air Transport Scenario in India and Stages of Development, National and International Organizations. **(2)**

9. **Airport Planning**: Aircraft Characteristics, Factors for Site Selection, Airport Classification, General Layout of an Airport. Obstructions and Zoning Laws, Imaginary Surfaces, Approach Zones and Turning Zones. **(3)**

10. **Runway Orientation and Design**: Head Wind, Cross Wind, Wind Rose Diagram, Basic Runway Length, Corrections, Geometric Design Elements, Runway Configuration. **(2)**

11. **Taxiway and Aircraft Parking**: Aircraft Parking System. Main Taxiway, Exit Taxiway, Separation Clearance, Holding Aprons. **(2)**

12. Visual Aids: Marking and Lighting of Runway and Taxiway, Landing Direction Indicator, and Wind Direction Indicator, IFR/VFR**.** **(2)**

Books Recommended:

1. Chandra S., and Aggarwal, "Railway Engineering", M.M. Oxford University Press, New Delhi, 2007.
2. Saxena, S.C., and Arora, S.P., "A Text Book of Railway Engineering", Dhanpat Rai and Sons, Delhi, 1997.
3. J. S. Mundrey, "Railway Track Engineering", McGraw Hill Publishing Co., 2009
4. Khanna, S.K., Arora, M.G., and Jain, S.S., "Airport Planning and Design", Nem Chand & Bros. Roorkee, 1999.
5. Horenjeff, R. and McKelvey, F., "Planning and Design of Airports", McGraw Hill Company, New York, 1994.
6. Norman J. Ashford, Saleh Mumayiz, Paul H. Wright, "Airport Engineering: Planning, Design and Development of 21st Century", Wiley Publishers, 2011

BTCE-705 PROJECT

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

L   T   P
0   0   6

Students are required to work on project in any of the areas related to Civil Engineering. The students will work 6 hrs per week with his / her supervisor(s).

BTME-901 Finite Element Methods

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

L	T	P
3	1	0

1. Introduction
The finite element method - the element characteristic matrix - element assembly and solution for unknowns - summary of finite element history - basic equations of elasticity – strain displacement relations - theory of stress and deformation - stress-strain-temperature relations.   **(3)**

2. The direct stiffness method
Structure stiffness equations - properties of [K] - solution of unknowns - element stiffness equations - assembly of elements - node numbering to exploit matrix sparsity - displacement boundary conditions - gauss elimination solution of equations conservation of computer storage - computational efficiency - stress computation - support reactions - summary of the finite element procedure.   **(4)**

3. Stationary principles, Rayleigh-Ritz and interpolation
Principle of stationary potential energy -problems having many d.o.f - potential energy of an elastic body - the Rayleigh-Ritz method -piecewise polynomial field - finite element form of Rayleigh-Ritz method - finite element formulations derived from a functional - interpolation - shape functions for C0 and C1 elements – lagrangian interpolation functions for two and three dimensional elements.   **(5)**

4. Displacement based elements for structural mechanics
Formulae for element stiffness matrix and load vector - overview of element stiffness matrices - consistent element nodal vector - equilibrium and compatibility in the solution - convergence requirements - patch test stress calculation – other formulation methods.   **(3)**

5. Straight sided triangles and tetrahedral
Natural coordinates for lines - triangles and tetrahedral -interpolation fields for plane triangles - linear and quadratic triangle - quadratic tetrahedron.   **(3)**

6. The isoparametric formulation
Introduction - an isoparametric bar element - plane bilinear element -summary of gauss quadrature - quadratic plane elements - direct construction of shape functions for transition elements - hexahedral (solid) isoparametric elements – triangular isoparametric elements - consistent element nodal loads - validity of isoparametric elements - appropriate order of quadrature - element and mesh instabilities - remarks on stress computation.   **(4)**

7. Coordinate transformation
Transformation of vectors - transformation of stress, strain and material properties - transformation of stiffness matrices - transformation of flexibility to stiffness – inclined support - joining dissimilar elements to one another- rigid links - rigid elements.   **(3)**

8. Bending flat plates
Plate bending theory - finite elements for plates - triangular discrete Kirchoff element - boundary

conditions.   **(3)**

9. Introduction to weighted residual method

Some weighted residual methods - galerkin finite element method - integration by parts - axially loaded bar - beam - plane elasticity.   **(3)**

Books:

1. Desai C.S., *Elementary Finite Element Method,* Prentice Hall of India
2. Chandrupatla T.R. & Belegundu A.D., *Introduction to Finite Elements in Engineering,* Prentice Hall of India
3. Bathe K.J., *Finite Element Procedures in Engineering Analysis,* Prentice Hall of India
4. Gallaghar R.H., *Finite Element Analysis: Fundamentals,* Prentice Hall Inc.
5. Rajasekaran S., *Finite Element Analysis in Engineering Design*, Wheeler Pub.
6. Krishnamoorthy C. S., *Finite Element Analysis - Theory and Programming,* Tata McGraw Hill
7. Zienkiewics O.C. & Taylor R.L., *The Finite Element Method,* Vol I & II, McGraw Hill

BTCE-902 Numerical Methods in Civil Engineering

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

L	T	P
3	1	0

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, Non-linear equations, Interpolation. **(6)**

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. **(6)**

3. New Marks Methods

Solution of determinate and indeterminate structures using Newmark's Procedure (Beam). **(4)**

4. Statistical Methods

Method of correlation and Regression analysis for fitting a polynomial equation by least square. **(6)**

5. Initial Value problem

Galerkin's method of least square, Initial Value problem by collocation points, Rungekutta Method.

(4)

6. New Marks Method

Implicit and explicit solution, solution for nonlinear problems and convergence criteria. **(4)**

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-903 Disaster Management

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

L	T	P
3	1	0

1. **Introduction to Disaster Management**: Define and describe disaster, hazard, emergency, vulnerability, risk and disaster management; Identify and describe the types of natural and non-natural disasters. Important phases of Disaster Management Cycle. **(5)**

2. **Disaster Mitigation and Preparedness**: Natural Hazards: causes, distribution pattern, consequences and mitigation measures for earthquake, tsunami, cyclone, flood, landslide drought etc. Man-made hazards: causes, consequences mitigation measures for various industrial hazards/disasters, Preparedness for natural disasters in urban areas. **(5)**

3. **Hazard and Risk Assessment**: Assessment of capacity, vulnerability and risk, vulnerability and risk mapping, stages in disaster recovery and associated problems. **(3)**

4. **Emergency Management Systems (EMS)**: Emergency medical and essential public health services, response and recovery operations, reconstruction and rehabilitation. **(2)**

5. **Capacity Building**: Gender sensitive disaster management approach, inculcate new skills and sharpen existing skills of government officials, voluntary activists, development of professional and elected representative for effective disaster management, role of media in effective disaster management, overview of disaster management in India, role of agencies like NDMA, SDMA and other International agencies, organizational structure, role of insurance sector, DM act and NDMA guidelines.. **(5)**

6. **Application of Geoinformatics and Advanced Techniques**: Use of Remote Sensing Systems (RSS) and GIS in disaster Management, role of knowledge based expert systems in hazard scenario, using risks-time charts to plan for the future, early warning systems. **(3)**

7. **Integration of public policy**: Planning and design of infrastructure for disaster management, Community based approach in disaster management, methods for effective dissemination of information, ecological and sustainable development models for disaster management. **(4)**

8. **Case Studies**: Lessons and experiences from various important disasters with specific reference to Civil Engineering. **(3)**

Books/References:
1. Natural Hazards in the Urban Habitat by Iyengar, C.B.R.I., Tata McGraw Hill.Pub
2. Natural Disaster management, Jon Ingleton (Ed), Published by Tudor Rose, Leicester
3. Disaster Management, R.B. Singh (Ed), Rawat Publications
4. ESCAP: Asian and the Pacific Report on Natural Hazards and Natural Disaster Reduction.
5. www.http//ndma,gov,in
6. Disaster Management –Future Challenges & Opportunities by Jagbir Singh, I.K. International Publishing House.

BTCE-904 Infrastructure Development & Management

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

L	T	P
3	1	0

1. **Introduction:** Impact of Infrastructure development on economic development, standard of living and environment. Reasons for rise of public sector and government in infrastructural activities. Changed socio-economic scenario and current problems and related issues. **(5)**

2. **Policies on Infrastructure Development**: A historical review of the Government policies on infrastructure. Current public policies on transportations, power and telecom sectors. Plans for infrastructure development. Legal framework for regulating private participation in roads and highways, Ports & Airports, Power and Telecom. **(5)**

3. **Construction and Infrastructure**: Construction component of various infrastructure sectors. Highway, ports and aviation, oil and gas, power, telecom, railways, irrigation. Current scenario, future needs, investment needed, regulatory framework, government policies and future plans. Technological and methodological demands on construction management in infrastructure development projects.

    (5)

4. **Infrastructure Management**: Importance, scope and role in different sectors of construction.

    • **Highway Sector**: Repayment of Funds, Toll Collection Strategy, Shadow tolling, and direct tolls, Maintenance strategy, Review of toll rates & structuring to suit the traffic demand,

    • **Irrigation Projects**: Large / Small Dams - Instrumentation, monitoring of water levels, catchments area, rainfall data management, prediction, land irrigation planning & policies, processes Barrages, Canals.

    • **Power Projects**: Power scenario in India, Estimated requirement, Generation of Power distribution strategies, national grid, load calculation & factors, Hydropower - day-to-day operations, management structures, maintenance, Thermal Power, Nuclear Power.

    • **Airports**: Requisites of domestic & International airports & cargo & military airports, facilities available, Terminal management, ATC.

    • **Railways**: Mass Rapid Transport System (MRTS), LRT, Multi-modal Transport System. **(15)**

Books:

1. Chandra, Prassanna, "Projects, Planning, Analysis, Selection, Financing, Implementation and Review", Tata McGraw-Hill, New Delhi, 2006.
2. Raghuram, G. & Jain, R., "Infrastructure Development & Financing Towards a Public-Private Partnership", Macmillan India Ltd., New Delhi, 2002.
3. India Infrastructure Report 2001 & 2002, Oxford University Press, New Delhi, 2001/02.
4. NICMAR, "Construction Business Opportunities in Infrastructure Development in India", NICMAR, Mumbai, 2001.
5. Parikh Kirit S., "India Development Report, 1999-2000", Oxford University Press, New Delhi, 2002.
6. GOI Rakesh Mohan Committee, "The India Infrastructure Report", National Council of Applied Economic Research, New Delhi, 1996.

BTCE-905 Ground Improvement Techniques

Internal Marks: 40	**L T P**
External Marks: 60	**3 1 0**
Total Marks: 100	

1. **Introduction to soil improvement without the addition of materials** - dynamic compaction equipment used - application to granular soils - cohesive soils - depth of improvement - environmental considerations - induced settlements - compaction using vibratory probes - vibro techniques vibro equipment - the vibro compaction and replacement process - control of verification of vibro techniques - vibro systems and liquefaction - soil improvement by thermal treatment - preloading techniques - surface compaction introduction to bio technical stabilization   **(8)**

2. **Introduction to soil improvement with the addition of materials** - lime stabilization - lime column method - stabilization of soft clay or silt with lime - bearing capacity of lime treated soils - settlement of lime treated soils - improvement in slope stability - control methods - chemical grouting - commonly used chemicals - grouting systems - grouting operations - applications - compaction grouting - introduction - application and limitations - plant for preparing grouting materials - jet grouting - jet grouting process - geometry and properties of treated soils - applications - slab jacking - gravel - sand - stone columns   **(10)**

3. **Soil improvement using reinforcing elements** - introduction to reinforced earth - load transfer mechanism and strength development - soil types and reinforced earth - anchored earth nailing reticulated micro piles - soil dowels - soil anchors - reinforced earth retaining walls.   **(7)**

4. **Geotextiles** - Behaviour of soils on reinforcing with geotextiles - effect on strength, bearing capacity, compaction and permeability - design aspects - slopes - clay embankments - retaining walls – pavements.   **(7)**

Reference books

1. Moseley, Text Book on Ground Improvement, Blackie Academic Professional, Chapman & Hall
2. Boweven R., Text Book on Grouting in Engineering Practice, Applied Science Publishers Ltd
3. Jewell R.A., Text Book on Soil Reinforcement with Geotextiles, CIRIA Special Publication, Thomas Telford
4. Van Impe W.E., Text Book On Soil Improvement Technique & Their Evolution, Balkema Publishers
5. Donald .H. Gray & Robbin B. Sotir, Text Book On Bio Technical & Soil Engineering Slope Stabilization, John Wiley
6. Rao G.V. & Rao G.V.S., Text Book On Engineering With Geotextiles, Tata McGraw Hill
7. Korener, Construction & Geotechnical Methods In Foundation Engineering, McGraw Hill
8. Shukla, S.K. and Yin, J.H. Fundamental of Geosynthetic Engineering, Taylor & Francis
9. Swamisaran, Reinforced Soil and its Engineering Application, New Age Publication
10. Gulati, S.K. and Datta, M., Geotechnical Engineering, TMH

BTCE – 906 Pre-stressed Concrete

		L	T	P
Internal Marks: 40				
External Marks: 60		**3**	**1**	**0**
Total Marks: 100				

Note: IS 1343 is permitted in examination.

1. **Materials for pre-stressed concrete and pre-stressing systems**
   High strength concrete and high tensile steel – tensioning devices – pre-tensioning systems – post tensioning systems. **(5)**

2. **Analysis of pre-stress and bending stresses** Analysis of pre-stress – resultant stresses at a sector – pressure line or thrust line and internal resisting couple – concept of load balancing – losses of pre-stress – deflection of beams. **(6)**

3. **Strength of pre-stressed concrete sections in flexure, shear and torsion** **(5)**

4. **Types of flexural failure** – strain compatibility method – IS:1343 code procedure – design for limit state of shear and torsion. **(4)**

5. **Design of pre-stressed concrete beams and slabs** **(5)**

6. Transfer of pre-stress in pre tensioned and post tensioned members – design of anchorage zone reinforcement – design of simple beams – cable profiles – design of slabs. **(5)**

Books
1. N. Krishna Raju, Pre-stressed concrete, Tata McGraw Hill
2. T.Y. Lin, Ned H. Burns, Design of Pre-stressed Concrete Structures, John Wiley & Sons.
3. P. Dayaratnam, Pre-stressed Concrete, Oxford & IBH
4. R. Rajagopalan, Pre-stressed Concrete.
5. IS 1343 2012 Code of Practice for Prestressed Concrete

BTCE - 951 Hydrology and Dams

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

1. Introduction

Precipitation: Importance of hydrological data in water resources planning. The hydrologic cycle. Mechanics of precipitation, types and causes, measurement by rain gauges, Gauge net-works, hyetograph, averaging depth of precipitation over the basin, mass-rainfall curves, intensity duration frequency curves, depth area-duration curves.

a) Interception, Evapo-transptration and Infiltration: Factors affecting interception, evaporation from free water surfaces and from land surfaces, transpiration, Evapo-transpiration.

b) Infiltration Factors affecting infiltration, rate, Infiltration capacity and its determination.   **(10)**

2. Runoff:

Factors affecting runoff, run-off hydrograph, unit hydrograph theory, S-curve hydrograph, Synder's synthetic unit hydrograph.   **(4)**

3. Peak Flows

Estimation of Peak flow-rational formula, use of unit hydrograph, frequency analysis, Gumbel's method, design flood and its hydrograph.   **(4)**

4. Gravity Dams-Spillways:

Creagers profiles neglecting velocity of approach, profile taking velocity of approach into account, Upstream lip and approach ramp, Advantages of gated spillways, Discharge characteristics of spillways.

(4)

5. Arch and Buttress Dams:

Classification of arch dam- constant radius, constant angle and variable radius , Cylinder theory, Expression relating central angle and Cross-Sectional area of arch. Types of buttress dams, Advantages of buttress dams.   **(4)**

6. Earth Dams:

Components of earth dams and their functions, Phreatic line determination by analytical and graphical methods.   **(4)**

Books:

1. Engineering Hydrology - J.Nemec, Prentice Hall
2. Engineering Hydrology by Stanley Buttler, John. Wiley
3. Ground Water Hydrology by TODD, John. Wiley
4. Engineering for Dams Vol. II & III by Creager Justin & Hinds. John. Wiley
5. Hydrology by. S.K.Garg, Khanna Pub
6. Hydrology Principles, Analysis and Design by. Raghunath, H M, New Age Int. Pub

BTCE-952 Traffic Engineering

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

1. Introduction
Elements of Traffic Engineering, Components of traffic system – road users, vehicles, highways and control devices. **(3)**

2. Vehicle Characteristics
IRC standards, Design speed, volume, Highway capacity and levels of service, capacity of urban and rural roads, PCU concept and its limitations. **(3)**

3. Traffic Stream Characteristics
Traffic stream parameters, characteristics of interrupted and uninterrupted flows. **(3)**

4. Traffic Studies
Traffic volume studies, origin destination studies, speed studies, travel time and delay studies, parking studies, accident studies. **(4)**

5. Traffic Regulation and Control
Signs and markings, Traffic System Management, At-grade intersections, Channelization, Roundabouts. **(3)**

6. Traffic Signals
Pre-timed and traffic actuated. Design of signal setting, phase diagrams, timing diagram, Signal co-ordination. **(4)**

7. Grade Separated Intersections
Geometric elements for divided and access controlled highways and expressways. **(3)**

8. Traffic Safety
Principles and practices, Road safety audit. **(4)**

9. Intelligent Transportation System
Applications in Traffic Engineering. **(3)**

Books:

1. William, R.M. and Roger, P.R., "Traffic Engineering", Prentice Hall.
2. Hobbs, F.D., "Traffic Planning and Engineering", Pergamon Press.
3. Khisty, C.J. and Kent, B.L., "Transportation Engineering – An Introduction", Prentice Hall of India Pvt. Ltd.
4. Kadiyali, L.R., "Traffic Engineering & Transport Planning", Khanna Publishers, New Delhi.
5. Mannering, "Principles of Highway Engineering & Traffic Analysis", Wiley Publishers, New Delhi.

BTCE-961 Building Maintenance & Safety

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

1. Principles of Maintenance

Importance of maintenance, deterioration and durability, factors affecting decision to carryout maintenance, maintenance and GNP, agencies causing deterioration, effect of deterioration agencies on materials.   **(4)**

2. Maintenance Management

Definition, organization structure, work force for maintenance, communication needs, building inspections, maintenance budget and estimates, property inspections and reports, specification for maintenance jobs, health and safety in maintenance, quality in maintenance, maintenance manual and their importance.   **(5)**

3. Materials for Maintenance

Compatibility of repair materials, durability and maintenance, types of materials, their specification and application, criteria for selection of material, use of commercial available materials in maintenance.

(4)

4. Maintenance Problems and Root Causes

Classification of defects, need for diagnosis, type of defects in building elements and building materials defect location, symptoms and causes.   **(4)**

5. Investigation and Diagnosis for Repair of Structures

Basic approach to investigations, physical inspection, material tests, non-destructive testing for diagnosis, estimation of actual loads and environmental effects, study of design and construction practices used in original construction, retrospective analysis and repair steps.

(6)

6. Remedial Measures for Building Defects

Preventive maintenance and special precautions - considerations, preventive maintenance for floors, joints, wet areas, water supply and sanitary systems, termite control, common repair techniques, common methods of crack repair - Repair of existing damp proofing systems in roofs, floors and wet areas - Protection, repair and maintenance of RCC elements - Repair, maintenance of foundations, basements and DPC - Repair of finishes - Repair of building joints - Repair of water supply and sanitary systems, underground and over head tank - Common strengthening techniques - Maintenance of Industrial Floors.

(7)

7. Maintenance of Multi-Storey Buildings

Specials features for maintenance of multi-storied buildings, including fire protection system, elevators booster pumps, generator sets.   **(4)**

Books:

1. Building Repair and Maintenance Management, by P. S. Gahlot
2. Maintenance of Buildings by A C Panchdhari
3. Maintenance and Repairs of Buildings by Pijush Kanti Guha

BTCE-962 Project Monitoring & Management

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

1. Introduction

Need for project planning & management, time, activity & event, barchart, Milestone chart, uses & drawbacks.   **(7)**

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**.   (8)**

3. CPM

Definitions, network construction, critical path, fundamental rules, determination of project schedule, activity time estimates, float types, their significance, numerical problems**.   (8)**

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 engineering projects. Introduction of relevant open source software(s)   **(9)**

Books:

1. PERT and CPM - L.S.Srinath, East West Press
2. Management Guide to PERT & CPM - Wiest & levy; Prentice Hall
3. Construction Equipment & Planning and Application. - Mahesh Verma , Artec Publication.
4. Construction Planning and Management by U. K. Shrivastava; Galgotia Publications Pvt. Ltd.