

# N.C.College of Engineering

## Israna-132107 (Panipat)



## Scheme and Syllabus

### 2016-17

# Civil Engineering

## Third Year (5th & 6th Semester)

# MARKS DISTRIBUTION (ACCORDING TO AUTONOMY)

## FOR ALL THEORY COURSES: -

1. On semester evaluation of all theory courses total: 100 marks

Distribution
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I. Mid semester exam:	20 marks
II. Mid semester exam:	20 marks
Continues Evaluation Test (CET):	20 marks
Attendance:	20 marks
Teacher's assessment:	20 marks

2) End semester (final examination) of all theory courses

Total: 100 marks

3) Total of on semester + end semester evaluation

is of : 200 marks

4) To pass a theory course student should obtain

Minimum: - 40 marks in on semester evaluation.

: - 35 marks in end semester evaluation.

Total: - 80 marks out of 200.

Criterion for passing and failing the theory course: -

- a) If students fails in on semester evaluation despite passing in aggregate one will have to repeat that course.
- b) If student pass in on semester evaluation but fails in end semester exam he/ she will be permitted to appear in supplementary examination.
- c) If student is pass both in on semester evaluation and end semester evaluation but fails in total then he/ she would have to appear in supplementary exam.
- d) If attendance in a course is below 75%, the student shall not be permitted to appear in the End- Semester Examination.

**FOR ALL PRACTICAL (LABORATORY) COURSES: -**

I) On semester evaluation of all practical (laboratory) courses would be of total: 120 marks.

**Distribution**

Performance of class practical:	60 marks
Reports of practical:	60 marks

II) End semester evaluation (final lab exam + oral or viva test)

Total: 80 marks

III) Total of on semester evaluation final lab examination + end semester evaluation is of : 200 marks

IV) To pass a lab course student should obtain

Minimum: - 48 marks in on semester evaluation.

28 marks in end semester evaluation.

Total- 80 marks out of -200

Criterion for passing and failing the lab course is just like theory course.

**CALCULATION OF SEMESTER GRADE POINT AVERAGE: -**

**Semester grade point average (SGPA)** is the weighted average of the grade for the subjects registered in a Semester and is computed as follows:

$$SGPA = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$$

$C_i$  denotes the Credits (or Units) assigned to the  $i$ th subject and  $G_i$  denotes the Grade Point Equivalent to the Letter Grade obtained for the  $i$ th subject.

**Cumulative Grade Point Average (CGPA)** is the weighted average of the grades of the subjects for the registered in the semester.

**N. C. COLLEGE OF ENGINEERING, ISRANA**  
**SCHEME OF STUDIES AND EXAMINATION**  
**B.Tech. –CIVIL ENGINEERING**  
**3<sup>rd</sup> Year (Semester–V) 2015**

Sr. No.	Subject Code.	Subject	BOS	Teaching Schedule			Contact Hours	Credits
				L	T	P		
1	CE-351	Structural Analysis-III	CIVIL	3	2	-	5	5
2	CE-352	Design of Concrete Structures-I	CIVIL	3	2	-	5	5
3	CE-353	Hydrology	CIVIL	3	1	-	4	4
4	CE-354	Geotechnology-I	CIVIL	3	1	-	4	4
5	CE-355	Project Planning & Management	CIVIL	3	-	-	3	3
6	CE-356	Engineering Geology	CIVIL	3	1	-	4	4
7	CE-35P1	Structural Mechanics-II Lab	CIVIL	-	-	2	2	1
8	CE-35P2	Concrete Lab	CIVIL	-	-	2	2	1
9	CE-35P3	Geotechnology Lab	CIVIL	-	-	2	2	1
			<b>TOTAL</b>	<b>18</b>	<b>7</b>	<b>6</b>	<b>31</b>	<b>28</b>

# N. C. COLLEGE OF ENGINEERING, ISRANA

## SCHEME OF STUDIES AND EXAMINATION

### B.Tech. –CIVIL ENGINEERING

#### 3<sup>rd</sup> Year (Semester–VI) 2015

Sr. No.	Course no.	Subject	BOS	Teaching Schedule			Contact Hours	Credits
				L	T	P		
1	CE-361	Design Of Steel Structure-II	CIVIL	3	1	-	4	4
2	CE-362	Irrigation Engineering	CIVIL	3	1	-	4	4
3	CE-363	Geotechnology-II	CIVIL	3	1	-	4	4
4	CE-364	Transportation Engineering-I	CIVIL	3	1	-	4	4
5	CE-365	Water supply & Treatment	CIVIL	3	1	-	4	4
6		Departmental Elective	CIVIL	3	-	-	3	3
7	CE-366	General Proficiency & Fitness	CIVIL	-	-	-	-	1
8	CE-36P1	Transportation Engineering Lab	CIVIL	-	-	2	2	1
9	CE-36P2	Environmental Engineering Lab	CIVIL	-	-	2	2	1
10	CE-36P3	Applications of Numerical Methods Lab	CIVIL	-	-	3	3	2
11	SSAA-360	Soft Skills and Analytical Ability	CIVIL	1	-	2	3	2
			<b>Total</b>	<b>19</b>	<b>5</b>	<b>9</b>	<b>33</b>	<b>30</b>

#### List of Departmental Electives

CE-36E1 Rock Mechanics

CE-36E2 Water Resources & System Engineering

CE-36E3 Remote Sensing & GIS

CE-36E4 Disaster Management

5<sup>th</sup> Semester (Civil Engineering)  
**STRUCTURAL ANALYSIS-III**  
**CE-351**

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**3**     **2**

**On Semester Evaluation: 100 Marks**  
**End Semester Evaluation: 100 Marks**

- Note: -**
- 1. There are NINE questions in a set of question-paper. All questions carry equal marks.**
  - 2. Attempt five questions in all. FIRST question is compulsory which covers the whole syllabus. Attempt ONE question from each of the other four Units.**

**UNIT-I**

**Influence Lines:** Introduction, influence lines for three hinged and two hinged arches, load position for Max. S.F. and B.M. at a section in the span.

**Influence Line for Statically Indeterminate Beams:** Muller-Breslau Principle, I.L. for B.M. & S.F. for continuous Beams.

**UNIT-II**

**Fixed Arches:** Expression for H and B.M. at a section, Elastic centre.

**Rolling Loads:** Introduction, Single concentrated load uniformly distributed load longer than span, shorter than span, two point loads, several point loads, Max. B.M. and S.F. Absolute, Max. B.M.

**UNIT-III**

**Kani's Method:** Analysis of continuous beams and simple frames, analysis of frames with different column lengths and end conditions of the bottom storey.

**UNIT-IV**

**Approximate Analysis of Frames:** For vertical loads, (ii) for lateral loads by Portal method & Cantilever method.

**Matrix Methods:** Introduction, Stiffness Coefficients, Flexibility Coefficients, Development of flexibility & stiffness matrices for plane frame, Global axis and local axis, analysis of plane frame, pin jointed and rigid jointed.

**Books:**

1. Advanced Structural Analysis – AK Jain, Nem Chand & Bros., Roorkee.
2. Structural Analysis – A Unified Approach, D.S. Prakash Rao, University Press, Hyderabad.
3. Structural Analysis – A Unified Classical & Matrix Approach, Ghali & A.M. Neville, Chapman & Hall, London.
4. Theory of Structures Vol I & II B. C Punmia, Ashok Kumar Jain & Arun K. Jain, Laxmi Publication, New delhi.
5. Theory of Structures Vol II S. P. Gupta, G. S. Pandit & Rajesh Gupta, Tata McGraw Hill.

5<sup>th</sup> Semester (Civil Engineering)  
**DESIGN OF CONCRETE STRUCTURES-I**  
**CE-352**

**L**    **T**  
**3**    **2**

**On Semester Evaluation: 100 Marks**  
**End Semester Evaluation: 100 Marks**

- Note: -**
- 1. There are NINE questions in a set of question-paper. All questions carry equal marks.**
  - 2. Attempt five questions in all. FIRST question is compulsory which covers the whole syllabus. Attempt ONE question from each of the other four Units.**

**UNIT-I**

**Elementary Treatment of Concrete Technology:** Physical requirements of cement, aggregate, admixture and reinforcement, Strength and durability, shrinkage and creep. Design of concrete mixes, Acceptability criterion, I.S. Specifications.

**Design Philosophies in Reinforced Concrete:** Working stress and limit state methods, limit state v/s working stress method, building code, normal distribution curve, characteristic strength and characteristics loads, design values, Partial safety factors and factored loads, stress-strain relationship for concrete and steel.

**UNIT-II**

**Working Stress Method:** Basic assumptions, permissible stresses in concrete and steel, design of singly and doubly reinforced rectangular and flanged beams in flexure, steel beam theory, inverted flanged beams, design examples.

**Limit State Method:** Basic assumptions, analysis and design of singly and doubly reinforced rectangular flanged beams, minimum and maximum reinforcement requirement, design examples.

**UNIT-III**

**Analysis and Design of Sections in Shear Bond and Torsion:** Diagonal tension, shear reinforcement, development length, anchorage and flexural bond, torsional, stiffness, equivalent shear, torsional reinforcement, design examples.

**Columns and Footings:** Effective length, minimum eccentricity, short columns under axial compression, Uniaxial and biaxial bending, slender columns, isolated and wall footings, design examples.

**Serviceability Limit State:** Control of deflection, cracking, slenderness and vibrations, deflection and moment relationship for limiting values of span to depth, limit state of crack width, design examples.

**UNIT-IV**

**Concrete Reinforcement and detailing:** Requirements of good detailing cover to reinforcement, spacing of reinforcement, reinforcement splicing, anchoring reinforcing bars in flexure and shear, curtailment of reinforcement.

**One-way and Two-ways Slabs:** General considerations, design of one way and two-ways slabs for distributed and concentrated loads, Non-rectangular slabs, opening in slabs, design examples.

**Retaining Walls:** Classification, forces on retaining walls, design criteria, stability requirements, proportioning of cantilever retaining walls, counterfort retaining walls, criteria for design of counterforts, design examples.

**Books:**

1. Design of Reinforced Concrete Structures by P.Dayaratnam, Oxford & IBM Pub., N.Delhi
2. Reinforced Concrete – Limit State Design, AK Jain, Nem Chand & Bros., Roorkee.

**HYDROLOGY**

**CE-353**

**L**    **T**  
**3**    **1**

**On Semester Evaluation: 100 Marks**

**End Semester Evaluation: 100 Marks**

- Note: - 1. There are NINE questions in a set of question-paper. All questions carry equal marks.**
- 2. Attempt five questions in all. FIRST question is compulsory which covers the whole syllabus. Attempt ONE question from each of the other four Units.**

**UNIT-I**

**Introduction:** Hydrologic cycle, scope and application of hydrology to engineering problems, drainage basins and its characteristics, stream geometry hypsometric curves.

**Precipitation:** Forms and types of precipitation, characteristics of precipitation in India, measurement of precipitation, recording and non recording raingages, raingage station, raingage network, estimation of missing data, presentation of rainfall data, mean precipitation, depth – area – duration relationship, frequency of point rainfall, intensity-duration-frequency curves, probable max. precipitation.

**UNIT-II**

**Evaporation & Transpiration:** Process, evaporimeters and empirical relationships, analytical method reservoir evaporation and methods of its control transpiration, evapotranspiration and its measurement, Penman's equation and potential evapotranspiration.

**Infiltration:** Infiltration process, initial loss, infiltration capacity and measurement of infiltration, infiltration indices.

**UNIT-III**

**Runoff:** Factor affecting run-off, estimation of runoff, rainfall-run off relationships, measurement of stage-staff gauge, wire gauge, automatic stage recorder and stage hydrograph, measurement of velocity-current meters, floats, area velocity method, moving boat and slope area method, electromagnetic, ultra-sonic and dilution methods of stream flow measurement, stage discharge relationship.

**Hydrograph:** Discharge hydrograph, components and factors affecting shape of hydrograph, effective rainfall, unit hydrograph and its derivation, unit hydrograph of different durations, use and limitations of UH, triangular UH, Snyder's synthetic UH, floods, rational methods, empirical formulae, UH method, flood frequency methods, Gumbel's method, graphical method, design flood.

**UNIT-IV**

**Ground Water:** Occurrence, types of aquifers, compressibility of aquifers, water table and its effects on fluctuations, wells and springs, movement of ground water, Darcy's law, permeability and its determination, porosity, specific yield and specific retention, storage coefficient, transmissibility.

**Well Hydraulics:** Steady state flow to well in unconfined and confined aquifers.

**Books:**

1. Hydrology by H.M. Raghunath
2. Elementary Hydrology by V.P. Singh
3. Hydrology for Engineers by Linsely, Kohler, Paulhus



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**On Semester Evaluation: 100 Marks**

**End Semester Evaluation: 100 Marks**

- Note: -**
- 1. There are NINE questions in a set of question-paper. All questions carry equal marks.**
  - 2. Attempt five questions in all. FIRST question is compulsory which covers the whole syllabus. Attempt ONE question from each of the other four Units.**

#### **UNIT-I**

**Sub-surface Exploration:** Purpose, stages in soil exploration, depth and lateral extent of exploration, guidelines for various types of structures, ground water observations, excavation and boring methods, soil sampling and disturbance, major types of samplers, sounding methods-SCPT, DCPT, SPT and interpretation, geophysical methods, pressure-meter test, exploration logs.

**Drainage & Dewatering:** Introduction, ditches and sumps, well point systems, shallow well system, deep well drainage, vacuum method, Electro-osmosis, consolidation by sand piles.

#### **UNIT-II**

**Shallow Foundations-I:** Design criteria for structural safety of foundation (i) location of footing, (ii) shear failure criterion, (iii) settlement criterion, ultimate bearing capacity, modes of shear failure, Rankine's analysis, Terzaghi's theory, Skempton's formula, effect of fluctuation of G.W.T., effect of eccentricity on bearing capacity, inclined load, I.S. Code recommendations, factors affecting bearing capacity, methods of improving bearing capacity.

**Shallow Foundations-II:** Various causes of settlement of foundation, allowable bearing pressure based on settlement, settlement calculation, elastic and consolidation settlement, allowable settlement according to I.S. Code. Plate load test and its interpretation, bearing capacity from penetration tests, design bearing capacity.

**Shallow Foundation-III:** Situation suitable for the shallow foundations, types of shallow foundations and their relative merits, depth of foundation, footing on slopes, uplift of footings, conventional procedure of proportioning of footings, combined footings, raft foundations, bearing capacity of raft in sands and clays, various methods of designing rafts, floating foundations.

#### **UNIT-III**

**Pile Foundations-I:** Introduction, necessity of pile foundations, classification of piles, load capacity, static analysis, analysis of pile capacity in sands and clays, dynamic analysis, pile load tests, negative skin friction, batter piles, lateral load capacity, uplift capacity of single pile, under-reamed pile.

**Pile Foundations-II:** Group action in piles, pile spacing, pile group capacity, stress on lower strata, settlement analysis, design of pile caps, negative skin friction of pile group, uplift resistance of pile group, lateral resistance, batter pile group.

#### **UNIT-IV**

**Drilled Piers and Caisson Foundations:** Drilled piers-types, uses, bearing capacity, settlement, construction procedure. Caissons-Types, bearing capacity and settlement, construction procedure well foundation-shapes, depth of well foundations, components, factors affecting well foundation design lateral stability, construction procedure, sinking of wells, rectification of tilts and shifts, recommended values of tilts & shifts as per I.S. 3955.

#### **Books:**

1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New Age Int. (P) Ltd.
2. Analysis and Design of Sub-Structures by Swamisaran, IBH & Oxford.
3. Principles of Foundation Engineering by B.M.Das, PWS Kent, Boston.
4. Foundation Analysis & Design by J.E. Bowles, McGraw-Hills
5. Foundation Design by Teng, Prentice Hall, India

5<sup>th</sup> Semester (Civil Engineering)  
**PROJECT PLANNING & MANAGEMENT**  
**CE-355**

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**On Semester Evaluation: 100 Marks**  
**End Semester Evaluation: 100 Marks**

- Note: - 1. There are NINE questions in a set of question-paper. All questions carry equal marks.**
- 2. Attempt five questions in all. FIRST question is compulsory which covers the whole syllabus. Attempt ONE question from each of the other four Units.**

**UNIT-I**

**Construction Management:** Significance, objectives and functions of construction management types of constructions, resources for construction industry, stages for construction, construction team, engineering drawings.

**Construction Contracts & Specifications:** Introduction, types of contracts, contract document, specifications important conditions of contract, arbitration.

**UNIT-II**

**Construction Planning:** Introduction, work breakdown structure, stages in planning-pre-tender stages, contract stage, scheduling by bar charts, preparations of material, equipment, labour and finance schedule, limitation of bar charts, milestone charts.

**Construction Organization:** Principles of Organization, communication, leadership and human relations, types of Organizations, Organization for construction firm, site organization, temporary services, job layout.

**UNIT-III**

**Network Techniques in Construction Management-I-CPM:** Introduction, network techniques, work break down, classification of activities, rules for developing networks, network development-logic of network, allocation of time to various activities, Fulkerson's rule for numbering events, network analysis, determination of project schedules, critical path, ladder construction, float in activities, shared float, updating, resources allocation, resources smoothing and resources levelling.

**Network Techniques in Construction Management-II-PERT:** Probability concept in network, optimistic time, pessimistic time, most likely time, lapsed time, deviation, variance, standard deviation, slack critical path, probability of achieving completion time, central limit theorem.

**UNIT-IV**

**Cost-Time Analysis:** Cost versus time, direct cost, indirect cost, total project cost and optimum duration, contracting the network for cost optimization, steps in time cost optimization, illustrative examples.

**Inspection & Quality Control:** Introduction, principles of inspection, enforcement of specifications, stages in inspection and quality control, testing of structures, statistical analysis.

**Books:**

1. Construction planning & Management by P.S. Gehlot & B.M.Dhir, Wiley Eastern Ltd.
2. PERT & CPM – Principles & Applications by L.S.Srinath. Affiliated East-west Press (P) Ltd.
3. Project Planning & Control with PERT & CPM by B.C. Punmia & K.K. Khandelwal, Lakshmi Pub. Delhi
4. Construction Management & Planning by B.Sengupta & H.Guha, Tata McGraw-Hills.

5<sup>th</sup> Semester (Civil Engineering)  
**ENGINEERING GEOLOGY**  
NC-CE-356

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**3**     **1**

**On Semester Evaluation: 100 Marks**  
**End Semester Evaluation: 100 Marks**

- Note: - 1. There are NINE questions in a set of question-paper. All questions carry equal marks.**
- 2. Attempt five questions in all. FIRST question is compulsory which covers the whole syllabus. Attempt ONE question from each of the other four Units.**

**UNIT-I**

**Introduction:** Definition, object, scope and sub division of geology, geology around us. The interior of the earth. Importance of geology in Civil Engineering projects.

**Physical Geology:** The external and internal geological forced causing changes weathering and erosion of the surface of the earth. Geological work of ice, water and winds. Soil profile and its importance. Earthquakes and volcanoes.

**UNIT-II**

**Mineralogy and Petrology:** Definition and mineral and rocks. Classification of important rock forming minerals, simple description based on physical properties of minerals. Rocks of earth surface, classification of rocks. Mineral composition, Texture, structure and origin of igneous, Sedimentary and Metamorphic rocks. Aims and principles of stratigraphy. Standard geological / stratigraphical time scale with its sub-division and a short description based on engineering uses of formation of India.

**Structural Geology:**

Forms and structures of rocks. Bedding plane and outcrops Dip and Strike. Elementary ideas about fold, fault, joint and unconformity and recognition on outcrops. Importance of geological structures in Civil Engineering projects.

**UNIT-III**

**Applied Geology:** Hydrogeology, water table, springs and Artesian well, aquifers, ground water in engineering projects. Artificial recharge of ground water, Elementary ideas of geological investigations. Remote sensing techniques for geological and hydrological survey and investigation. Uses of geological maps and interpretation of data, geological reports.

**Suitability and Stability of foundation Sites and Abutments:** Geological condition and their influence on the selection, location, type and design of dams, reservoirs, tunnels, highways, bridges etc. Landslides and Hill-slope stability.

**UNIT-IV**

**Improvement of Foundation Rocks:** Precaution and treatment against faults, joints and ground water, retaining walls and other precautions. Geology and Environment of Earth.

**Note:** The physical study of rock samples and minerals may be performed in the tutorials.

**Books:**

1. A Text Book of Geology by P.K. Mukherjee
2. Physical and General Geology by S.K. Garg
3. Engineering and General Geology by Prabin Singh



**Tests on Cement:**

- 1) Standard consistency of cement using Vicat's apparatus.
- 2) Fineness of cement by Sieve analysis and Blaine's air permeability method.
- 3) Soundness of cement by Le-Chatelier's apparatus.
- 4) Setting time of cement, initial and final.
- 5) Compressive strength of cement.
- 6) Measurement of specific gravity of cement.
- 7) Measurement of Heat of Hydration of cement.

**Tests on Aggregate:**

- 1) Moisture content and bulking of fine aggregate.
- 2) Fineness modulus of coarse and fine aggregates.

**Tests on Concrete:**

- 1) Workability of cement concrete by (a) Slump Test, (b) Compaction factor test, (c) Flow table test.
- 2) Compressive strength of concrete by (a) Cube test, (b) Cylinder test
- 3) Indirect tensile strength of concrete – split cylinder test.
- 4) Modulus of rupture of Concrete by flexure test
- 5) Bond strength between steel bar and concrete by pull-out test
- 6) Non-destructive testing of concrete

5<sup>th</sup> Semester (Civil Engineering)  
**GEOTECHNOLOGY LAB**  
**CE-35P3**

**P**  
**2**

**On Semester Evaluation: 120 Marks**  
**End Semester Evaluation: 80 Marks**

- 1) Grain Size Analysis-Hydrometer method.
- 2) Shrinkage Limit Determination.
- 3) Relative Density of Granular Soils.
- 4) Consolidated Drained (CD) Triaxial Test.
- 5) Consolidated Undrained (CU) Triaxial Test with Pore Water Pressure measurement.
- 6) Consolidation Test.
- 7) Undisturbed Sampling.
- 8) Standard Penetration Test.
- 9) Dynamic Cone Penetration Test.
- 10) Model Plate Load Test.

6th Semester (Civil Engineering)  
**DESIGN OF STEEL STRUCTURES-II**  
**CE-361**

**L**     **T**  
**3**     **1**

**On Semester Evaluation: 100 Marks**  
**End Semester Evaluation: 100 Marks**

- Note: - 1. There are NINE questions in a set of question-paper. All questions carry equal marks.**
- 2. Attempt five questions in all. FIRST question is compulsory which covers the whole syllabus. Attempt ONE question from each of the other four Units.**

**UNIT-I**

**Elementary Plastic Analysis and Design:** Introduction, Scope of plastic analysis, ultimate load carrying capacity of tension members and compression members, flexural members, shape factor, mechanisms, plastic collapse, analysis, plastic analysis applied to steel beams and simple portal frames and design.

**UNIT-II**

**Design of Water Tanks:** Introduction, permissible stresses, design of circular, rectangular and pressed steel tanks including staging.

**Design of Steel Stacks:** Introduction, various loads to be considered for the design of steel stacks, design of steel stacks including foundation.

**UNIT-III**

**Towers:** Transmission line towers, microwave towers, Design loads, classification, design procedure and specification.

**Cold Formed Sections:** Introduction and brief description of various types of cold formed sections, local buckling, concepts of effective width and effective sections, elements with stiffeners, design of compression and bending elements.

**UNIT-IV**

**Industrial Buildings:**

Loads, general arrangement and stability, design considerations, design of purlins, design of roof trusses, industrial building frames, bracing and stepped columns.

**Books:**

1. Design of Steel Structures, A.S. Arya & J.L.Ajmani, Nem Chand & Bros. Roorkee.
2. Design of Steel Structures, P.Dayaratnam, Wheeler Pub. Allahabad.
3. Design of Steel Structures, Gaylord & Gaylord, McGraw-Hill, New York / International Students Edn., Toyo Kogakusha, Tokyo.
4. IS:800-2000, Indian Standard Code of Practice for General Construction in Steel.
5. Design Of steel structures By N. Subramanyan, Oxford University Press.

6th Semester (Civil Engineering)  
**IRRIGATION ENGINEERING**  
**CE-362**

**L**    **T**  
**3**    **1**

**On Semester Evaluation: 100 Marks**  
**End Semester Evaluation: 100 Marks**

- Note: - 1. There are NINE questions in a set of question-paper. All questions carry equal marks.**  
**2. Attempt five questions in all. FIRST question is compulsory which covers the whole syllabus. Attempt ONE question from each of the other four Units.**

**UNIT – I**

Water Requirement of Crops: Types and Methods of irrigation, duty and Delta relationship, Factors affecting duty, Irrigation efficient, Consumptive use and its determination, Soil moisture – irrigation relationship, Depth and frequency of irrigation. Canal Irrigation: Canal alignment, canal losses, Estimation of design discharge of a canal Hydraulics of alluvial channels, Types and economics of lining, Water logging – effects, cause, remedial measure, land drainage, Design of tile drains.

**UNIT – II**

Design of Hydraulic Structure: Types, consideration in design, Causes of failure of hydraulic structure founded on previous foundation, Bligh creep theory and Khosla seepage theory. Dams and Spillways : Types, design

**UNIT – III**

Canal Head works : Layout and parts of diversion head works, location, Design of weir and barrage, canal head regulator, River training for canal head works, sediment control in canals. Canal Regulation Works: Canal falls necessity, location types and classification of falls, Roughening measures for energy dissipation, cistern element, Design of glacis fall. Cross regulators and distributor's head regulator; Canal escape, Meeting flumes

**UNIT – IV**

Outlets: Canal outlets requirement of a good outlet, Types, Criteria for judging the performance of outlets, Design principle of open flume outlet and A.P.M outlet.  
Cross Drainage Works: Need, Types, Selection of suitable CD work, design of transitions for canal waterways, uplifts pressure on bottom floor CD works.

**Text/Reference Books:**

1. Irrigation, Water Resources and Water Power Engg. by P.N.Modi.
2. Fundamentals on Irrigation Engg. by Bharat Singh.
3. Irrigation Engg. & Hydraulic Structures by S.K. Garg.
4. Irrigation Engg. by S.K. Sharma.
5. Irrigation – Theory & Practice by A.M. Michael.



6th Semester (Civil Engineering)  
**GEOTECHNOLOGY-II**  
**CE-363**

**L**    **T**  
**3**    **1**

**On Semester Evaluation: 100 Marks**  
**End Semester Evaluation: 100 Marks**

- Note: - 1. There are NINE questions in a set of question-paper. All questions carry equal marks.**
- 2. Attempt five questions in all. FIRST question is compulsory which covers the whole syllabus. Attempt ONE question from each of the other four Units.**

**UNIT-I**

**Earth Dams:** Introduction, types of sections, earth dam foundations, causes of failure and criteria for safe design, control of seepage through the embankment, control of seepage through the foundation, drainage of foundations, criterion for filter design. Introduction to rock fill dams.

**Stability of Slopes:** Causes of failure, factors of safety, stability analysis of slopes-total stress analysis, effective stress analysis, stability of infinite slopes types of failures of finite slopes, analysis of finite slopes-mass procedure, method of slices, effect of pore pressure, Fellenius method to locate center of most critical slip circle, friction circle method, Taylor's stability number, slope stability of earth dam during steady seepage, during sudden draw down and during and at the end of construction.

**UNIT-II**

**Braced Cuts:** Depth of unsupported vertical cut, sheeting and bracing for deep excavation, movements associated with sheeting and bracing, modes of failure of braced cuts, pressure distribution behind sheeting.

**Cofferdams:** Introduction, types of cofferdams, design and lateral stability of braced cofferdams, design data for Cellular cofferdams, stability analysis of cellular cofferdams on soil and rock, inter-lock stresses.

**UNIT-III**

**Cantilever Sheet Piles:** Purpose of sheet piles, cantilever sheet piles, depth of embedment in granular soils-rigorous method, simplified procedure, cantilever sheet pile, penetrating clay and limiting height of wall.

**Anchored Bulkheads:** Methods of design, free earth support method in cohesionless and cohesive soils, fixed earth support method in cohesionless soils-Blum's equivalent beam method.

**UNIT-IV**

**Soil stabilization:** Soil improvement, shallow compaction, mechanical treatment, use of admixtures, lime stabilization, cement stabilization, lime fly ash stabilization, dynamic compaction and consolidation, Bituminous stabilization, chemical stabilization, pre-compression, lime pile and column, stone column, grouting, reinforced earth.

**Basics of Machine Foundations:** Terminology, characteristics elements of a vibratory systems, analysis of vibratory motions of a single degree freedom system-undamped free vibrations, undamped forced vibrations, criteria for satisfactory action of a machine foundation, degrees of a freedom of a block foundation, Barken's soils spring constant, Barken's method of a determining natural frequency of a block foundation subjected to vertical oscillations.

**Books:**

1. Analysis and Design of Foundation and Retaining Structures by S.Prakash, Gopal Rajan & S.Saran, Sarita Prakashan.
2. Analysis and Design of Sub-Structures by Swami Saran, IBH Oxford.
3. Basic and Applied Soil Mechanics by Gopal Rajan and ASR Rao, Newage Int. Pub.
4. Soil dynamic by Shamsheer Prakash, McGraw-Hill.
5. Foundation Design by Teng, Prentice Hall.
6. Soil Mechanics & Foundation Engineering by Bharat Singh, Shamsheer Prakash, Nem Chand & Bros., Roorkee.
7. Soil Mechanics and Foundation Engineering by Alam Singh.

6th Semester (Civil Engineering)  
**TRANSPORTATION ENGINEERING-I**  
**CE-364**

**L**    **T**  
**3**    **1**

**On Semester Evaluation: 100 Marks**  
**End Semester Evaluation: 100 Marks**

- Note: -**
- 1. There are NINE questions in a set of question-paper. All questions carry equal marks.**
  - 2. Attempt five questions in all. FIRST question is compulsory which covers the whole syllabus. Attempt ONE question from each of the other four Units.**

**UNIT-I**

**Introduction:** Transportation and its importance. Different modes of transportation. Brief review of history of road development in India and abroad: Roman, Tresagne, Telford and Macadam constructions. Road patterns. Classification of roads, Objectives of highway planning, planning surveys. Saturation system of planning.

**Highway Plans, Highway Alignment and Surveys:** Main features of 20 years road development plans in India. Requirements of an ideal highway alignment. Factors affecting alignment. Surveys for highway alignment.

**UNIT-II**

**Cross Section Elements and Sight Distance Considerations:** Cross section elements: friction, carriageway, formation width land width, camber, IRC recommended values. Types of terrain Design speed. Sight distance, stopping sight distance, overtaking sight distance, overtaking zones, intermediate sight distance, sight distance at intersections, head light sight distance, set back distance. Critical locations for sight distance.

**Design of Horizontal and Vertical Alignment:** Effects of centrifugal force. Design of superelevation. Providing superelevation in the field. Radius of circular curves. Extra-Widening. Type and length of transition curves. Gradient, types, values. Summit curves and valley curves, their design criterion. Grade compensation on curves.

**UNIT-III**

**Traffic Characteristics and Traffic Surveys:** Road user and vehicular characteristics. Traffic studies such as volume, speed and O & D study. Parking and accident studies. Fundamental diagram of traffic flow. Level of service. PCU. Capacity for non-urban roads. Causes and preventive measures for road accidents.

**Traffic control Devices:** Traffic control devices: signs, signals, markings and islands. Types of signs. Types of signals. Design of an isolated fixed time signal by IRC method. Intersections at grade and grade separated intersections. Design of a rotary. Types of grade separated intersections.

**UNIT-IV**

**Highway Materials: Soil and Aggregates:** Subgrade soil evaluation: CBR test, plate bearing test. Desirable properties of aggregates. Various tests, testing procedures and IRC/IS specification for suitability of aggregates. Proportioning of aggregates for road construction by trial and error and Routhfuch method.

**Bituminous Materials and Bituminous Mixes:** Types of bituminous materials: bitumen, tar, cutback and emulsions, Various test, testing procedures and IRS/IS specifications for suitability of bituminous materials in road construction. Bituminous mix, desirable properties. Marshall' method

of mix design. Basic concept of use of polymers and rubber modified bitumen in bituminous mixes.

**Books:**

1. Highway Engg. by S.K. Khanna & C.E.G. Justo, Nem Chand & Bros., Roorkee.
2. Principles of Transportation and Highway Engg. by G.V.Rao, Tata McGraw Hill Pub., N.Delhi.
3. Traffic Engg. And Transport Planning by L.R.Kadiyali, Khanna Pub. Delhi.
4. Traffic Engg.by Matson, T.M., Smith, W.S. and Hurd, P.W. McGraw Hill Book Co., New York.

6th Semester (Civil Engineering)  
**WATER SUPPLY AND TREATMENT**  
**CE-365**

**L**    **T**  
**3**    **1**

**On Semester Evaluation: 100 Marks**  
**End Semester Evaluation: 100 Marks**

- Note: -**
- 1. There are NINE questions in a set of question-paper. All questions carry equal marks.**
  - 2. Attempt five questions in all. FIRST question is compulsory which covers the whole syllabus. Attempt ONE question from each of the other four Units.**

**UNIT-I**

**Water Quantity:** Importance and necessity of water supply scheme. Water demands and its variations. Estimation of total quantity of water requirement. Population forecasting. Quality and quantity of surface and ground water sources. Selection of a source of water supply. Types of intakes.

**UNIT-II**

**Water Quality:** Impurities in water and their sanitary significance. Physical, chemical and bacteriological analysis of water. Water quality standards.

**UNIT-III**

**Water Treatment:** Objectives, treatment processes and their sequence in conventional treatment plant, sedimentation – plain and aided with coagulation. Types, features and design aspects. Mixing basins and Flocculation units. Filtration-mechanism involved, types of filters, slow and rapid sand filtration units (features and design aspects). Disinfection principles and aeration.

**UNIT-IV**

**Water Distribution:** Distribution system – Gravity system, Pumping System, Dual System, Layout Distribution system – Dead End System, Grid Iron System, Ring System, Radial System, merits and demerits. Distribution Reservoir-functions & determination of storage capacity. Modern Methods of disinfection in water treatment / application of Jar Test in WTP

**Books:**

1. Water Supply and Sewerage: E.W.Steel.
2. Water Supply Engineering: S.R.Kshirsagar.
3. Water Supply Engineering: S.K. Garg.
4. Water Supply Engineering: B.C. Punmia.
5. Manual on Water Supply and Treatment: Ministry of Urban Dev., New Delhi.

6th Semester (Civil Engineering)  
**GENERAL PROFICIENCY & FITNESS**  
**CE-366**

**L T**

**On Semester Evaluation: 100 Marks**  
**End Semester Evaluation: 100 Marks**

6th Semester (Civil Engineering)  
**TRANSPORTATION ENGINEERING -I LAB**  
**CE-36P1**

**P**  
**2**

**On Semester Evaluation: 120 Marks**  
**End Semester Evaluation: 80 Marks**

**LIST OF EXPERIMENTS:**

1. Aggregate Impact Test.
2. Los-Angeles Abrasion Test on Aggregates.
3. Dorry's Abrasion Test on Aggregates.
4. Devel Attrition Test on Aggregates.
5. Crushing Strength Test on Aggregates.
6. Penetration Test on Bitumen.
7. Ductility Test on Bituminous Material.
8. Viscosity Test on Bituminous Material.
9. Softening Point Test on Bitumen.
10. Flash and Fire Point Test on Bitumen.
11. Standard Penetration Test.
12. California Bearing Ration Test (CBR)

6th Semester (Civil Engineering)  
**ENVIRONMENTAL ENGINEERING-I LAB**  
**CE-36P2**

**P**  
**2**

**On Semester Evaluation: 120 Marks**  
**End Semester Evaluation: 80 Marks**

**LIST OF EXPERIMENTS:**

1. To determine the pH value of a given sample of water.
2. To determine the turbidity in given water sample.
3. To determine the acidity of given sample of water.
4. To determine the alkalinity of given sample of water.
5. To determine temporary and permanent hardness in a given water sample.
6. To determine the chlorine dose required for a given water sample.
7. To determine total suspended dissolved settleable solids in a water sample.
8. To determine Biochemical Oxygen Demand (BOD) of given water Sample.
9. To determine Chemical Oxygen Demand COD of given water Sample.



6th Semester (Civil Engineering)  
**APPLICATION OF NUMERICAL METHODS LAB**  
**CE-36P3**

**P**  
**3**

**On Semester Evaluation: 120 Marks**  
**End Semester Evaluation: 80 Marks**

**LIST OF EXPERIMENTS:**

1. Computation of roots of a polynomial using Bisection method.
2. Computation of roots of a polynomial using Newton-Raphson method
3. Solution of linear simultaneous equation using Gauss Elimination / Gauss Jordan / Triangulation factorization method.
4. Solution of system of non-linear equation using fixed point / Newton Raphson / modified Newton-Raphson method.

6th Semester (Civil Engineering)  
**SOFT SKILLS AND ANALYTICAL ABILITY**  
SSAA-360

**L T P**  
**1 0 2**

**On Semester Evaluation: 100 Marks**  
**End Semester Evaluation: 100 Marks**

**UNIT I 5 Weeks (5L+0T+10P)**

**QUANTITATIVE APTITUDE**

**Arithmetic/ Algebraic/ Trigonometry**

1. Numbers, Divisibility Test, HCF and LCM
2. Logarithms, Surds and Indices
3. Functions
4. Sequences and Series
5. Set Theory
6. Permutation and Combination
7. Probability
8. Mensuration
9. Trigonometry

**Word Problems**

1. Averages
2. Percentages
3. Profit and Loss
4. Simple and Compound Interest
5. Ratio, Proportion and Variation
6. Time, Speed and Distance/ Upstream and Downstream / Train
7. Time and Work
8. Mixtures and Alligation
9. Clocks, Pipes and Cisterns
10. Calendar

**UNIT II 5 weeks (5L+0T+10P)**

**QUALITATIVE APTITUDE AND DATA INTERPRETATION**

**Data Interpretation and Logical Reasoning**

1. Tabular Presentation
2. Bar Charts
3. X - Y Charts
4. Pie Charts
5. Mixed diagrams

**Logical reasoning**

1. Family Tree
2. Conditional ties and Grouping
3. Codes
4. Data Sufficiency

**Text Books**

1. Quantitative Aptitude R.S Aggarwal
2. Verbal and Non Verbal Reasoning by R.S Aggarwal

6th Semester (Civil Engineering)  
**SOFT SKILLS AND ANALYTICAL ABILITY**  
**SSAA-360**

Syllabus ‘ English for Professional Purposes (EPP) for 6<sup>th</sup> Semester Students’

**UNIT III      5 Weeks (5L+0T+10P)**

1. **Antonyms:** It tests the extent of vocabulary. Among the four/five choices offered, the word that means the opposite of the given word is to be chosen.
2. **Analogies:** It tests the ability to see a relationship in a pair of words, to understand the ideas expressed in the relationship, and to recognize a similar or parallel relationship. Each analogy question begins with a pair of capitalized stem words. The task is to determine the relationship between the stem words and to choose the pair of words with the same relationship from the answer choices.
3. **Sentence completion:** It tests the ability to recognize relationships among parts of a sentence. These problems present an incomplete sentence. In some problems there is one word missing, in others, two words. In both cases, the word or words that best complete the sentence must be chosen from the answer choices.
4. **Reading comprehension:** It tests the ability to read and understand a passage. Passages can be about any subject (the most common themes are politics, history, science, business and the humanities), followed by a series of questions.
5. **Spotting the errors:** It tests the command over the structure of English language by finding error in the structure of a given sentence.

Antonyms and Analogies test the vocabulary. Sentence Completion and Reading Comprehension test the reading skills.

**Reference Books:**

1. Sharon Weiner Green and Ira K. Wolf (latest edn.): Barron’s How to Prepare for the GRE, Graduate Record Examination, New York.
2. David Kaplan (2011): Kaplan New GRE 2011-2012 Premier (English), New York.
3. David Kaplan (2008): Kaplan GMAT Verbal Workbook (2nd edn.), New York.
4. [Doug French](#) (2nd edn.): Verbal Workout for the GMAT, (Graduate School Test Preparation), [Princeton Review](#).
5. P.C. Wren and H. Martin (1995): High School English Grammar and Composition, N.D.V. Prasada Rao (ed.), S. Chand and Company, New Delhi.

6<sup>th</sup> Semester (Civil Engineering)  
**ROCK MECHANICS**  
**CE-36E1**  
(Departmental Elective)

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**3**    **1**

**On Semester Evaluation: 100 Marks**  
**End Semester Evaluation: 100 Marks**

- Note: - 1. There are NINE questions in a set of question-paper. All questions carry equal marks.**  
**2. Attempt five questions in all. FIRST question is compulsory which covers the whole syllabus. Attempt ONE question from each of the other four Units.**

### **UNIT-I**

#### **Introduction:**

Importance of rock mechanics, composition of rocks, geological and lithological classification of rocks, classification of rocks for engineering purposes, R.Q.D. method of classification of rocks. Theories of Brittle failure.

#### **Laboratory Testing of Rocks:**

Various methods of obtaining rock cores, methods of sample preparation, methods of removing end friction of the rock samples. Compression testing machine, Uniaxial compression strength of rock samples, methods of finding tensile strength-direct and indirect methods, Brazilian test, shear box test, triaxial shear test, punch shear test.

### **UNIT-II**

#### **In-situ Testing of Rocks:**

Field direct shear test on rock blocks, field triaxial strength, use of flat jacks, chamber test, plate load test, cable jacking test.

#### **Stress Evaluation in Field:**

Stress-relief technique (over coring), use of strain gauges, bore hole, deformation cell, photo-elastic stress meter, stress measurement with flat jack. Hydraulics Fracturing Techniques.

### **UNIT-III**

#### **Stabilization of Rocks:**

Rock bolting, principle of rock bolting, various types of rocks bolts, application of rock bolting. Field testing of rock bolts and cable anchors.

#### **Elastic and Dynamic Properties of Rocks:**

Stress-strain behavior dynamic properties, resonance method and ultra-sonic pulse method.

### **UNIT-IV**

#### **Pressure on Roof of Tunnels:**

Trap door experiment, Terzaghi's theory, Bieramer, kommerel, Protodyakanov theory.

#### **Stress Around the Tunnels:**

Basic design and Principles of tunnels in rocks, design of pressure tunnels in rocks.

#### **Books:**

1. Rock Mechanics, Vol. I, II, III, IV by Lama, et.al.
2. Fundamentals of Rock Mechanics by Jaeger and Cook
3. Rock Mechanics by Stagg & Zienkiewicz
4. Rock Mechanics & Design of Structures in Rocks by Obert & Duvell

6th Semester (Civil Engineering)  
**WATER RESOURCES & SYSTEMS ENGINEERING**  
**CE-36E2**

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**On Semester Evaluation: 100 Marks**  
**End Semester Evaluation: 100 Marks**

- Note: - 1.     There are NINE questions in a set of question-paper. All questions carry equal marks.**
- 2. Attempt five questions in all. FIRST question is compulsory which covers the whole syllabus. Attempt ONE question from each of the other four Units.**

**UNIT-I**

**Water Resources Planning:**

Role of water in national development, assessment of water resources, planning process, environmental consideration in planning, system analysis in water planning, some common problems in project planning, functional requirements in multipurpose projects, Reservoir planning-dependable yield, sedimentation in reservoir, reservoir capacity, empirical-area reduction method.

**UNIT-II**

**Economic and Financial Analysis:**

Meaning and nature of economic theory, micro and macro economics the concept of equilibrium, equivalence of kind, equivalence of time and value, cost benefit, discounting factors and techniques, conditions for project optimality, cost benefit analysis, cost allocation, separable and non-separable cost, alternate justifiable and remaining benefit methods, profitability analysis.

**UNIT-III**

**Water Resources Systems Engineering:**

Concept of system's engineering, optimal policy analysis, simulation and simulation modeling, nature of water resources system, analog simulation, limitations of simulation, objective function, production function, optimality condition, linear, non-linear and dynamic programming, applications to real time operations of existing system, hydrologic modeling and applications of basic concepts.

**UNIT-IV**

**Applications of System Approach in Water Resources:**

Applications of system engineering in practical problems like hydrology, irrigation and drainage engineering, distribution network mathematical models for forecasting and other water resources related problems.

**Books:**

1. Water Resources Engineering by Linseley and Franzini.
2. Economics of Water Resources Engineering by James and Lee.
3. Optimisation Theory and Applications by S.S.Roy.
4. Water Resources Systems Planning & Economics by R.S.Varshney.
5. Operational Research-An Introduction by Hamdy A.Taha.

6th Semester (Civil Engineering)

**REMOTE SENSING & GIS**

**CE-36E3**

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**On Semester Evaluation: 100 Marks**

**End Semester Evaluation: 100 Marks**

- Note: - 1.     There are NINE questions in a set of question-paper. All questions carry equal marks.**
- 2.     Attempt five questions in all. FIRST question is compulsory which covers the whole syllabus. Attempt ONE question from each of the other four Units.**

**UNIT-I**

**Introduction to Remote Sensing:**

Basic concepts of remote sensing; Airborne and space borne sensors; Data acquisition; Digital image Processing; Restoration; Enhancement; Segmentation feature extraction; Clustering edge detection;

**UNIT-II**

**GIS:**

Geographic Information System; Introduction to Microwave remote sensing and Global Positioning System;

**UNIT-III**

**Applications of RS & GIS:**

Applications to Water resources; Land use and erosion; Forestry; Environment and ecology;

**UNIT-IV**

**Software Applications:**

Use of relevant software for Remote sensing and GIS applications

**Books:**

1. GPS and Surveying using GPS by Gopi S, Tata McGraw-Hill
2. Introduction to GIS by Chang, Tata Mc Graw – Hill
3. An Introduction to Geographical information Systems by Heywood, Cornelius and Carver, Pearson Edu., N. Delhi

**6<sup>th</sup> Semester Civil Engineering**  
**DISASTER MANAGEMENT**  
**CE-36E4**

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3 -

On Sem. Evaluation 100  
End Sem. Evaluation 100

**Note 1.** There are nine questions in a set of paper. All questions carry equal marks.

**2.** Attempt five questions in all. First question is compulsory which carry whole syllabus. Attempt One question from each of the other four units.

### **UNIT – I**

**Introduction to Disaster Management:** Natural and Man made Disasters- International Year of Disaster Reduction.

**Hydro-meteorological based disasters I:** Tropical Cyclones, Floods, droughts.

### **Unit-II**

**Hydro-meteorological based disasters II:** Desertification Zones and Forest Fires.

**Geological based disasters:** Earthquake, Tsunamis, Landslides, and Avalanches.

### **Unit-III**

**Manmade Disasters I:** Chemical Industrial hazards, major power break downs, traffic accidents, Fire hazards etc.

**Manmade Disasters II:** Chemical Industrial hazards, major power break downs, traffic accidents, Fire hazards etc.

### **Unit-IV**

**Use of remote sensing and GIS** in disaster mitigation and management.

#### **Text Books**

1. Thomas D. Schneid., Disaster Management and Preparedness, CRC Publication, USA, 2001
2. Patrick Leon Abbott, Natural Disasters, Amazon Publications, 2002

#### **Ref. Books**

1. Ben Wisner., At Risk: Natural Hazards, People vulnerability and Disaster, Amazon Publications, 2001
2. Oosterom, Petervan, Zlatanova, Siyka, Fendel, Elfriede M., “Geo-information for Disaster Management”, Springer Publications, 2005