

**MAHARSHI DAYANAND UNIVERSITY, ROHTAK**  
**SCHEME OF STUDIES & EXAMINATIONS**  
**B.Tech. 3<sup>rd</sup> YEAR CIVIL ENGINEERING, SEMESTER- V**  
**Proposed “F” Scheme effective from 2011-12**

Subject Code	Subject Name	L	T	P	Total	Sessional Marks	Theory Marks	Sem Practical Marks	Total Marks
CE-301-F	Design of Steel Structure- I	3	1	-	4	50	100	0	150
CE-303-F	Transportation Engg.-I	3	1	0	4	50	100	0	150
CE-305-F	Water Supply-Treatment	3	1	0	4	50	100	0	150
CE-307-F	Soil Mechanics	3	1	0	4	50	100	0	150
CE-309-F	Numerical Methods And Computing Techniques	3	1	0	4	50	100	0	150
CE-311-F	Hydrology	3	1	0	4	50	100	0	150
CE-313 F	DSS-Drg.Lab	2	0	3	5	25	-	25	50
CE-315-F	Soil Mechanics Lab	0	0	2	2	25	0	25	50
CE-317 F	Transportation Lab-I	0	0	2	2	25	0	25	50
CE-319-F	Survey Camp	0	0	0	0	50	0	0	50
CE-321-F	Auto Cad Lab	0	0	2	2	25	0	25	50
	Total	20	6	9	35	450	600	100	1150

**Note:**

- 1) Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.
- 2) Assessment of Practical Training-I, undergone at the end of IV semester, will be based on seminar, viva-voce, report and certificate of practical training obtained by the student from the industry. According to performance letter grades A, B, C, F are to be awarded. A student who is awarded 'F' grade is required to repeat Practical Training.

## CE-301 F DESIGN OF STEEL STRUCTURES-I

L T P  
3 1

Sessional: 50 Marks  
Theory : 100 Marks  
Total : 150 Marks  
Duration of exam : 3Hrs.

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### SECTION-A

Unit-I: Introduction: Properties of structural steel. I.S.Rolled sections and I.S. specifications.

Unit-II: Connections: Importance, various types of connections, simple and moment resistant, riveted, bolted and welded connections.

Unit-III: Design of Tension Members: Introduction, types of tension members, net sectional areas, design of tension members, lug angles and splices.

### SECTION-B

Unit-IV: Design of Compression Members: Introduction, effective length and slenderness ratio, various types of sections used for columns, built up columns, necessity, design of built up columns, laced and battened columns including the design of lacing and battens, design of eccentrically loaded compression members.

Unit-V: Column Bases and Footings: Introduction, types of column bases, design of slab base and gusseted base, design of gusseted base subjected to eccentrically loading, design of grillage foundations.

### SECTION-C

Unit-VI: Design of Beams: Introduction, types of sections, general design criteria for beams, design of laterally supported and unsupported beams, design of built up beams, web buckling, web crippling and diagonal buckling.

Unit-VII: Gantry Girders: Introduction, various loads, specifications, design of gantry girder.

### SECTION-D

Unit-VIII: Plate Girder: Introduction, elements of plate girder, design steps of a plate girder, necessity of stiffeners in plate girder, various types of stiffeners, web and flange splices (brief introduction), Curtailment of flange plates, design beam to column connections: Introduction, design of framed and seat connection.

### **Books Recommended:**

- 1.Design of steel structures, A.S.Arya & J.L.Ajmani, Nem chand & Bros., Roorkee.
- 2.Design of steel structures, M.Raghupati, TMH Pub., New Delhi.
- 3.Design of steel structures, S.M.A.Kazmi & S.K.Jindal, Prentice Hall, New Delhi.
- 4.Design of steel structures, S.K.Duggal, TMH Pub, New Delhi.

## CE-310 F TRANSPORTATION ENGINEERING- I

L T P  
3 1 -

Sessional: 50 Marks  
Theory : 100 Marks -  
Total : 150 Marks  
Duration of exam: 3 Hrs.

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### SECTION-A

#### UNIT-I

Highway Plans, Highway Alignment and Surveys

Main features of 20 years road development plans in India. Requirement of an ideal high way alignment. Factors affecting alignment, Surveys for high way alignments.

Classifications of roads. Objectives of highway planning. surveys Saturation system of planning.

#### UNIT –II

Cross section elements and sight distance considerations.-Cross section elements, friction, carriage way, 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 inter sections, head light sight distance, set back distance.Critical locations for sight distance.

### SECTION-B

#### UNIT –III

Design of horizontal and vertical alignments-

Effects of centrifugal force. Design of super elevation. Providing super elevation in the field.Radiuos of circular curves. Extra widening. Type and length of transition curves.Gradiednt, types, values.Smmit curves and valley curves, their design criterions. Grade compensation on curves.

#### UNIT-IV

Traffic characteristics and traffic surveys, road user and vehicular characteristics .Traffic studies such as volume, speed and O & D studies. Parking and accident studies. Fundamental diagram of traffic flows. Level of service.PCU.Capacity for non urban roads. Causes and preventing measures for road accidents.

### SECTION-B

#### UNIT –V

High way materials

Sub grade soil evaluation, CBR test, plate bearing test, desirable properties of aggregates, various testes ,testing procedures and IRC/IS specifications for suitability of aggregates

Types of Bituminous materials.

Bitumen,tar, Cut back,emulsions. Various tests, testing procedures and IRS/Is specifications for stability of bituminous materials in road construction.Bitumenous mix, desirable properties.Marshell method of mix design. Basic concept of use of polymers and rubber modified bitumen in bituminous mixes.

## SECTION-C

### UNIT –VI

Rail way Transport

System of rail ways ,permanents ways, components ,requirements of gauge, gauge, types of gauges ,rails, function of rails ,composition ‘types of rails, length of rail, rail joints, type of rail joints, coning and wheel,tilting,failure of rails, creeps wearing,buckling,welding,Sleepers,Types of sleepers Functions,Requirements,Ballasts,Functions,Types of ballast size and sections, and quantities,fixure and fastening,function,typr of fastening,requirements,spikes,types of spikes,bolts,keys,.

## SECTION-D

### UNIT-VII

Track geometries,gradients,types of gradients,curves,types of curves, super elevations, relation super elevation with gauge ,speed and radius of curves, pointing crossing, technical terms, turn out,switches,type of switches,crossings,type of crossing,junction,type of junction,plating,method of plating, relaying of track, method of relaying of track, railway station,purpose,site selection,requirements,classification of stations,yards,classification of yards, necessity of equipments, level crossing,signals,classification of signals,interlocking,method of inter locking, Maintenance and drainage, classification of maintenance.

### UNIT –VIII

Tunnels-Necessity of tunnels, classification of tunnels, shape of tunnels, cross section of tunnels, surveying of tunnels, shafts, purpose of shafts, constructionofshafts, lining of tunnels, types of lining, construction of lining and methods of lining. Maintenance and drainage of tunnels.

### **Books Recommended:**

1. Highway Engg by S.K.Khanna & C.E.G. Justo, Nem Chand Bros., Roorkee.
2. Principles and Practice of Highway Engg. by L.R.Kadiyali, Khanna Publishers, Delhi.
3. Principles of Pavement Design by Yoder,E.J & Witzak,M.W., John Wiley and Sons, USA.
4. Tunnel Engineering by S.C.Saxena, Dhanpat Rai Publications, N.Delhi.
5. A text book of Tunnel, Bridges and Railway Engg. by S.P.Bindra, Dhanpat Rai Delhi.
6. Railway Engineering by N.L.Arora

## CE-305 F WATER SUPPLY AND TREATMENT

L T P

3 1 -

Sessional: 50 Marks

Theory : 100 Marks -

Total : 150 Marks

Duration of exam: 3 Hrs.

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### SECTION-A

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 borne diseases, water quality standards.

### SECTION-B

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.

Other water treatment processes: Purification processes in natural systems, water softening, removal of taste and odour, advanced methods of water treatment, defluoridation, dissolved solids removal.

### SECTION-C

Unit-IV: Water Conveyance System: Conveyance of water, Intake structures, Rising and Gravity system, Dual systems, Pumping Systems and pumping stations, valves and appurtenances, pipe materials and pipe fitting, O&M and trouble shooting for conveyance system.

### SECTION-D

Unit-V: Water Distribution System: Layout of Distribution system – Dead End system, Grid Iron system, Ring system, Radial system, their merits and demerits, Distribution Reservoir- functions and determination of storage capacity, Water Distribution Network, analysis of distribution network, layout, capacity and pressure requirements, leak detection, Maintenance, Water supply in buildings and plumbing.

#### Books Recommended:

1 Water Supply and Sewerage: E.W. Steel.

2. Water Supply and Sewage by Terence J.McGhee.

3. Water Supply Engineering: S.R. Kshirsagar.
4. Water Supply Engineering: S.K. Garg.
5. Water Supply Engineering: B.C. Punmia, Ashok Jain & Arun Jain.
6. Manual on Water Supply and Treatment: Ministry of Urban Dev., New Delhi.
7. Water Supply Waste Disposal and Environmental Pollution Engineering by A.K.Chatterjee.
8. Elements of Public Health Engineering by K.N.Duggal.
9. Water Supply and Sanitary Engineering by G.S Birdie and J.S. Birdie.
10. Environmental Engineering by Howard S.Peavy, Donald R. Rowe and George Tchobanoglous.
11. Water and Waste Water Technology by Mark T Hammer.

## CE- 307 F SOIL MECHANICS

L T P

3 1 -

Sessional: 50 Marks

Theory : 100 Marks -

Total : 150 Marks

Duration of exam: 3 Hrs.

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### SECTION-A

#### Unit-I: Soil Formation and Composition

Introduction, soil and rock, Soil Mechanics and Foundation Engineering, origin of soils, weathering, soil formation, major soil deposits of India, particle size, particle shape, inter-particle forces, soil structure, principal clay minerals.

#### Unit-II: Basic Soil Properties

Introduction, three phase system, weight-volume relationships, soil grain properties, soil aggregate properties, grain size analysis, sieve analysis, sedimentation analysis, grain size distribution curves, consistency of soils, consistency limits and their determination, activity of clays, relative density of sands.

#### Unit-III: Classification of soils

Purpose of classification, classification on the basis of grain size, classification on the basis of plasticity, plasticity chart, Indian Standard Classification System.

#### Unit-IV: Permeability of Soils

Introduction, Darcy's law and its validity, discharge velocity and seepage velocity, factors affecting permeability, laboratory determination of coefficient of permeability, determination of field permeability, permeability of stratified deposits.

### SECTION-B

#### Unit-IV: Effective Stress Concept

Principle of effective stress, effective stress under hydrostatic conditions, capillary rise in soils, effective stress in the zone of capillary rise, effective stress under steady state hydro-dynamic conditions, seepage force, quick condition, critical hydraulic gradient, two dimensional flow, Laplace's equation, properties and utilities of flow net, graphical method of construction of flow nets, piping, protective filter.

#### Unit-V: Compaction

Introduction, role of moisture and compactive effect in compaction, laboratory determination of optimum moisture content, moisture density relationship, compaction in field, compaction of cohesionless soils, moderately cohesive soils and clays, field control of compaction.

## SECTION-C

### Unit-VI: Vertical Stress Below Applied Loads

Introduction, Boussinesq's equation, vertical stress distribution diagrams, vertical stress beneath loaded areas, Newmark's influence chart, approximate stress distribution methods for loaded areas, Westergaard's analysis, contact pressure.

### Unit-VII: Compressibility and Consolidation

Introduction, components of total settlement, consolidation process, one-dimensional consolidation test, typical void ratio-pressure relationships for sands and clays, normally consolidated and over consolidated clays, Casagrande's graphical method of estimating pre-consolidation pressure, Terzaghi's theory of one-dimensional primary consolidation, determination of coefficients of consolidation, consolidation settlement, Construction period settlement, secondary consolidation.

## SECTION-D

### Unit-VIII: Shear Strength

Introduction, Mohr stress circle, Mohr-Coulomb failure-criterion, relationship between principal stresses at failure, shear tests, direct shear test, unconfined compression test, tri-axial compression tests, drainage conditions and strength parameters, Vane shear test, shear strength characteristics of sands, normally consolidated clays, over-consolidated clays and partially saturated soils, sensitivity and thixotropy.

### Unit-IX: Earth Pressure

Introduction, earth pressure at rest, Rankine's active & passive states of plastic equilibrium, Rankine's earth pressure theory, Coulomb's earth pressure theory, Culmann's graphical construction, Rebhann's construction.

### Books Recommended:

1. Basic and Applied Soil Mechanics by Gopal Ranjan, ASR Rao, New Age International(P)Ltd.Pub.N.Delhi.
2. Soil Engg. in Theory and Practice, Vol .I, Fundamentals and General Principles by Alam Singh, CBS Pub.,N.Delhi.
3. Engg.Properties of Soils by S.K.Gulati, Tata-Mcgraw Hill,N.Delhi.
4. Geotechnical Engg. by P.Purshotam Raj,Tata Mcgraw Hill.
5. Principles of Geotechnical Engineering by B.M.Das,PWS KENT, Boston.



## CE-309-F NUMERICAL METHODS

L T P  
3 1 -

Sessional: 50 Marks  
Theory : 100 Marks  
Total : 150 Marks  
Duration of exam: 3 Hrs.

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### SECTION-A

Interpolation and curve fitting : Interpolation problem, Lagrangian polynomials, Divided differences, Interpolating with a cubic spline, Bezier curves and B-spline curves, Least square approximations.

Non-Linear Equations : Bisection method, Linear Interpolation methods, Newton's method, Muller's method, fixed-point method.

### SECTION-B

Simultaneous Linear Equations : Elimination method, Gauss and Gauss-Jordan method, Jacobi's method, Gauss-Seidal method, Relaxation method.

Numerical Differentiation and Integration : Derivatives from differences tables, Higher order derivatives, Extrapolation techniques, Newton-cotes integration formula, Trapezoidal rule, Simpson's rules, Boole's rule and Weddle's rule, Romberg's Integration.

### SECTION--C

Numerical Solution of Ordinary Differential Equations : Taylor series method, Euler and modified Euler method, Runge-Kutta methods, Milne's method, Adams-Moulton method, Power method for Eigen values by iteration.

Roots of equation; Graphical methods, Newton Raphson,s methods, Solution of ordinary differential equation by Runge Kutta Method. Solution of linear algebraic equations by Relaxation Methods

### SECTION-D

Numerical Solution of Partial Differential Equations : Finite difference approximations of partial derivatives, solution of Laplace equation (Standard 5-point formula only), one-dimensional heat equation (Schmidt method, Crank-Nicolson method, Dufort and Frankel method) and wave equation.

Numerical Interpolation; Linear and Lagrangian Interpolation .Numerical intergration.Trapezoidal andSimpson,s Rule. Curve fitting. Linear and polynomial regression. Curve fitting. Linear and polynomial regression.

**TEXT BOOKS :**

1. Applied Numerical Analysis : Curtis F. Gerald and Patrick G. Wheatley-Pearson, Education Ltd.
2. Numerical Method : E. Balagurusamy T.M.H.

**REFERENCE BOOKS :**

1. Numerical Methods for Scientific and Engg. Computations : M.K. Jain, .R.K. Iyenger and R.K. Jain-Wiley Eastern Ltd.
2. Introductory Methods of Numerical Analysis S.S. Sastry,P.H.I.
3. Numerical Methods in Engg. & Science : B.S. Grewal.

## CE-311-F HYDROLOGY

L T P

3 1 -

Sessional: 50 Marks

Theory : 100 Marks

Total : 150 Marks

Duration of exam: 3 Hrs.

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### SECTION-A

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

Unit-II: 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.

### SECTION-B

Unit-III: Evaporation & Transpiration: Process, evaporimeters and empirical relationships, analytical method, reservoir evaporation and methods of its control, transpiration, evapo-transpiration and its measurement, Penman`s equation and potential evapo-transpiration.

Unit-IV: Infiltration: Infiltration process, initial loss, infiltration capacity and measurement of infiltration, infiltration indices.

### SECTION-C

Unit-V: 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.

Unit-VI: 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.

### SECTION-D

Unit-VII: 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.

Unit-VIII: Well Hydraulics: Steady state flow to wells in unconfined and confined aquifers.

Books Recommended:

1 Engineering Hydrology by K.Subramanya.

2 Hydrology by H.M.Raghunath.

3 Hydrology for Engineers by Linsely, Kohler, Paulhus.

4 Elementary Hydrology by V.P.Singh.

## CE-315 F SOIL MECHANICS LAB

L T P

- - 2

Sessional: 25 Marks

Exam : 25 Marks -

Total : 50 Marks

Duration of exam: 3 Hrs.

### List of Experiments:

1. Visual Soil Classification and water content determination.
2. Determination of specific gravity of soil solids.
3. Grain size analysis-sieve analysis.
4. Liquid limit and plastic limit determination.
5. Field density by:
  - Sand replacement method
  - Core cutter method
6. Proctor's compaction test.
7. Coefficient of permeability of soils.
8. Unconfined compressive strength test.
9. Direct shear test on granular soil sample.
10. Unconsolidated undrained(UU) triaxial shear test of fine grained soil sample.

### Books Recommended:

- 1 Soil Testing for Engineers by S.Prakash, PK Jain, Nem Chand & Bros.,Roorkee.
- 2 Engineering Soil Testing by Lambi, Wiley Eastern.
- 3 Engineering Properties of Soils and their Measurement by J.P.Bowles, McGraw Hill.
- 4 Soil Engineering in Theory and Practice, Vol.II, Geotechnical Testing and Instrumentation by Alam Singh, CBS Pub.

## **CE-321 F Auto Cad Lab**

L T P  
- - 2

Sessional: 25 Marks  
Exam : 25 Marks -  
Total : 50 Marks  
Duration of exam: 3 Hrs.

Introduction to CAD:

Introduction to interactive computing and use of graphics requirement of interactive computing dedicated v/s time sharing models interactive interface.

Computer Aided Drafting Introduction

AutoCAD Basic drawing and editing,

Commands for 2d drawings, simple drawing exercise... for application of auto cad commands

Advanced 2d drafting using, auto cad, use of layers and blocks exercises on simple drawings.

Introduction to 3d drafting simple exercise on 3d drafting walk through exercises

**CE -319 F SURVEY CAMP AS PER COURSE WORK**

L T P  
- - -

Sessional: 50 Marks  
Total:50 marks

## **CE-313 F Design of steel Structures Drawings**

L T P  
2-0-3

Sessional -25  
Practical-25  
Total-50

1 Structural Drawings of various types of welded connections (Simple and eccentric)

2. Beam to column connections

3 Column bases – slab bases – gusset base and grillage foundations

4. Plate girders'

5 Roof trusses

6 TENSION MEMBERS AND COMPRESSION MEMBERS.

7 Strut joints, tie joints, purlin joints.

Book Recommended

- 1 Design of steel structures - A.S. Arya & J. I. Ajmani Nem Chand & Bros Roorke
- 2 M. Raghupati .TMH Pub New Delhi
- 3 Design of steel structures S. M. A. Kazm S . K Jindal Prentice HALL New Delhi



## CE-317 F Transportation Engineering Lab-I

L T P  
0-0-2

Sessional -25  
Practical-25  
Total-50

- 1.Flakiness and elongation test
- 2 Marshal Stability test
- 3 C B R Valiue test
- 4.Bulk density and Void test
- 5 Dorry Abrasion Test
- 6 Specific gravity test
- 7 Solubility Test
- 8 Aggregate Hardness ,Toughness,cementation,adhesiveness test
- 9 Shearing test on soil
- 10 Aggregate Water absorption Test

**MAHARSHI DAYANAND UNIVERSITY, ROHTAK**  
**SCHEME OF STUDIES & EXAMINATIONS**  
**B.Tech. 3<sup>rd</sup> YEAR CIVIL ENGINEERING, SEMESTER- VI**  
**Proposed “F” Scheme effective from 2011-12**

Subject Code	Subject Name	L	T	P	Total	Class Marks	Sem Theory Marks	Sem Practical Marks	Total Marks
CE-302-F	Design of Concrete Structures-II	4	2	0	6	50	100	0	150
CE-304-F	Irrigation Engineering-I	3	1	0	4	50	100	0	150
CE-306-F	Geotechnology	3	1	0	4	50	100	0	150
CE-308-F	Sewerage And Sewage Treatment	3	1	0	4	50	100	0	150
CE-310-F	Transportation Engg.-II	3	1	0	4	50	100	0	150
CE-312-F	Engineering Geology	3	1	0	4	50	100	0	150
CE-314-F	Geotechnology Lab	0	0	2	2	25	0	25	50
CE-316-F	Transportation Engg.-II Lab	0	0	2	2	25	0	25	50
CE-318-F	Engineering Geology Lab	0	0	2	2	25	0	25	50
CE-320-F	Environmental Engg. Lab	0	0	2	2	25	0	25	50
GPCE-318-F	General Proficiency	0	0	1	1	0	0	50	50
	Total	19	7	9	35	400	600	150	1150

**NOTE:**

1. Students will be allowed to use non-programmable scientific calculator. However, sharing of Calculator will not be permitted in the examination.
2. Each student has to undergo practical training of 6 weeks during summer vacation and its evaluation shall be carried out in the VII semester.

## CE-302 F DESIGN OF CONCRETE STRUCTURES-11

L T P

4 2 -

Sessional: 50 Marks

Theory : 100 Marks -

Total : 150 Marks

Duration of exam: 3 Hrs.

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### SECTION-A

Unit-I: Continuous Beams-Basic assumptions, Moment of inertia, settlements, Modification of moments, maximum moments and shear, beams curved in plan-analysis for torsion, redistribution of moments for single and multi-span beams, design examples.

Unit-II: Flat slabs and staircases-Advantages of flat slabs, general design considerations, approximate direct design method, design of flat slabs, openings in flat slab, design of various types of staircases, design examples.

### SECTION-B

Unit-III: Foundations-Combined footings, raft foundation, design of pile cap and piles, under-reamed piles, design examples.

Unit-IV: Water Tanks, Silos and Bunkers-Estimation of Wind and earthquake forces, design requirements, rectangular and cylindrical underground and overhead tanks, Intze tanks, design considerations, design examples.

Silos and Bunkers-Variou theories, Bunkers with sloping bottoms and with high sidewalls, battery of bunkers, design examples. '

### SECTION-C

Unit-V: Prestressed Concrete-Basic principles, classification of pre-stressed members, various pre-stressing systems, losses in pre-stress, initial and final stress conditions, analysis and design of sections for flexure and shear, load balancing concept, IS Specifications.

End blocks-An lysis of stresses, Magnel's method, Guyon's method, Bursting and spalling stresses, design examples.

Unit-VI: Building Frames-Introduction, Member stiffnesses, Loads, Analysis for vertical and lateral loads, Torsion in buildings, Ductibility of beams, design and detailing for ductility, design examples.

### SECTION-D

Unit-VII: Yield Line Theory-Basic assumptions, Methods of analysis, yield line patterns and failure mechanisms, analysis of one way and two way rectangular and non-rectangular slabs, effect of top corner steel in square slabs, design examples.

Books Recommended:

1. Plain and Reinforced Concrete, Vol.2, Jai Krishna & O.P.Jain, Nem Chand & Bros.,Roorkee.
2. Pre-Stressed Concrete, N.Krishna Raju, TMH Pub.,N.,Delhi.
3. Design of Prestressed Concrete Structure^, T.Y.Lin, John Wiley & Sons., N.Delhi.
4. Reinforced Concrete-Limit Stage Design, A.K.Jain, Nem Chand & Bros.,Roorkee.
5. IS 1343-1980.IS Code of Practice for Pre-stressed Concrete.
6. IS 3370-1976(Part 1 to IV), Indian Standard Code of Practice for Liquid Retaining Structures.
7. IS 456-2000, Indian Standard of Practice for Plain and Reinforced Concrete.
8. IS 1893, 4326 & 13920 Indian Standard Code of Practice for Earthquake Resistant Design of Structures.

## CE-304 -F IRRIGATION ENGINEERING I

L T P

3 1 -

Sessional: 50 Marks

Theory : 100 Marks -

Total : 150 Marks

Duration of exam: 3 Hrs.

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### SECTION-A

Unit-I: Regulation works: Canal falls-necessity and location, development of falls, design of cistern element, roughening devices, Principal of design of Sarda type fall, design of straight Glacis fall. Off-take alignment, cross-regulator and distributor}' head regulators, devices to control silt entry into the off-taking channel and silt ejector, canal escapes, types of escapes.

### SECTION-B

Unit-II: Cross drainage works: Classification and their selection, Fundamentals of hydraulic design aspects of aqueducts, syphon aqueducts, super passage, canal syphon and level crossing, design of transitions.

Unit-III: Diversion canal headworks: Varies components and their functions, layout plan, selection of site for diversion headworks, Bligh's creep theory, Khosla's method of independent variables, use of Khosla's curves, various corrections, silt excluders.

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### SECTION-C

Unit-IV: Storage Headworks: Types of dams, selection of a site, gravity dam-two dimensional design, forces acting, stability criterion, elementary profile of a dam, cutoffs and drainage galleries, arch dams-constant angle and constant radius arch dam, simple design and sketches, most economical angle, Earth dam, design principles, seepage through earth dams, seepage line, control of seepage, design of filters.

### SECTION-D

Unit-V: Spillways and Energy Dissipations: Essential requirements of spillway and spillway's capacity, types of spillways and their suitability, Ogee spillways, chute, side channel, shaft and syphon spillways, energy dissipation below spillways, stilling basins, USBR and I.S. Stilling Basins.

#### Books Recommended:

1. Irrigation, Water Resources and Water Power Engineering by P.N.Modi.

2. Fundamentals on Irrigation Engineering by Bharat Singh.
3. Irrigation Engineering and Hydraulic Structures by S.K.Garg.
4. Theory and Design of Irrigation Structures Vol.1 &- II by R.S.Varshney, Gupta & Gupta.

## CE-306 F GEOTECHNOLOGY

L T P

3 1 -

Sessional: 50 Marks

Theory : 100 Marks

Total : 150 Marks

Duration of exam: 3 Hrs.

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### SECTION-A

#### Unit-I: 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 centre 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.

### SECTION-B

#### 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.

#### Unit-III : 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.

### SECTION-C

#### Unit-IV: 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, limiting height of wall.

#### Unit-V- Anchored Bulkheads

Methods of design, free earth support method in cohesionless and cohesive soils, fixed earth support method in cohesionless soils-Slum's equivalent beam method.

### SECTION-D

#### Unit-VI: 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. .

#### Unit-VII: 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 soil spring constant, Barken's method of a determining natural frequency of a block foundation subjected to vertical oscillations.

#### **Books Recommended:**

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



## CE-308F-SEWAGE AND TREATMENT

L T P

3 1 -

Sessional: 50 Marks

Theory : 100 Marks -

Total : 150 Marks

Duration of exam: 3 Hrs.

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### SECTION-A

Unit-I: Collection of sewage

Importance of *sanitation*, Systems of sewerage - separate, combined and partially separate. Quantity of sanitary sewage and variations. Shapes of sewer- circular and egg shaped. Design of sewers, self **cleansing Velocity and slopes**, **Construction and testing of sewer lines. Sewer materials, joints and appurtenances.**

**Unit –II Sewage collection from houses and buildings, general principal for design of a sanitary plumbing system, Traps function and types, System of plumbing, testing of house sewer, sanitary fittings and other accessories, ventilation of house drainage, waste water recycling in building**

### SECTION-B

Unit – III

Quality parameters- BOD, COD, Solids, D.O., Oil & Grease, tests on quality parameters, Sewage disposal , type relative advantage and disadvantage of various sewage disposal system Indian, Standards for disposal effluents into inland surface sources and on land. Bangalore method and Indore method of sewage disposal. Disposal of sewage by dilution - self-purification of streams. Sewage disposal by irrigation (Sewage treatment).

Unit IV

Digestion and disposal of primary and secondary sludge – Moisture content, sludge digestion process,, Factors affecting, sludge digestion tanks, disposal of digested sludge

### SECTION-C

Unit-V: Sewage Treatment

Objectives of sewage Treatment, classification of treatment process, Preliminary treatment -screening and grit removal units. Skimming tanks, Theory and design aspects of sedimentation, coagulation, merit and demerits of coagulation

Secondary treatment- Biological Filtration – Trickling Filter, High rate Trickling Filter advantage and disadvantages, miscellaneous type of filter, Humus tank, activated sludge process & its modifications, aeration tanks, secondary sedimentation tanks

## Unit VI

Stabilization pond, oxidation pond, Oxidation ditches, aeration lagoons, anaerobic stabilization units -, septic tank and Inhoff tank. Sludge Digestion UASB process sequence and efficiencies of conventional treatment units, Process Design of a complete sewage treatment plant, Examples

### SECTION-D

## Unit VII

Noise Pollution- Definition and introduction, Effect of Noise, characteristics of sound and it's measurement, level of noise , noise rating system and standards, source of noise their levels and controls

## Unit VIII

Air pollution –Definition of air pollution, Effects of air pollution, Dispersion of air pollution in atmosphere, Dispersion models and equations, Air pollution controls.

### Books Recommended:

1. Waste Water Engineering: Metcalf and Eddy.
2. Sewage and Sewage Treatment: S.K. Garg.
3. Sewage and Sewage Treatment: S.R. Krishan.Sagar.
4. Waste Water Engineering: B.C. Punmia.
5. Manual C: Sewerage and Sewage Treatment: Ministry of Urban Dev., New Delhi.

## CE-310 F TRANSPORTATION ENGINEERING II

L T P

3 1 -

Sessional: 50 Marks

Theory : 100 Marks -

Total : 150 Marks

Duration of exam: 3 Hrs.

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### SECTION-A

#### UNIT-I-Design of Flexible Pavements

Types of pavements. Flexible and rigid pavements. Components of a pavement and their functions. Factors affecting design of pavements. Design of thickness of a flexible pavement by Group Index method, CBR method (including latest IRC guidelines), Triaxial method and Burmister's method.

#### Unit-II Design of Rigid Pavements

Westergaard's theory, critical locations of loading, load and temperature stresses. Critical combination of stresses. IRC guidelines for determination of thickness of a rigid pavement.

Joints: requirements, types, patterns. Spacing of expansion and contraction joints. Functions of dowel and tie bars.

### SECTION-B

#### Unit-III-Highway Construction: Non-Bituminous Pavements

Brief introduction to earthwork machinery: shovel, hoe, clamshell, dragline, bulldozers. Principles of field compaction of subgrade. Compacting equipments. Granular roads. Construction steps of WBM. WMM. Construction of cement concrete pavements, Slip-form pavers, Basic concepts of the following: soil stabilized roads, use of geo-synthetics, reinforced cement concrete pavements, prestress concrete pavements, roller compacted concrete pavements and fibre reinforced concrete pavements.

#### Unit-IV Construction of Bituminous Pavements

Various types of bituminous constructions. Prime coat, tack coat, seal coat and surface dressing. Construction of BUSG, Premix carpet, BM, DBM and AC. Brief coverage of machinery for construction of bituminous roads: bitumen boiler, sprayer, pressure distributor, hot-mix plant, cold-

mix plant, tipper trucks, mechanical paver or finisher, rollers. Mastic asphalt. Introduction to various IRC and MOST specifications.

## SECTION-C

### **Unit-V Highway Maintenance**

Pavement failures. Maintenance operations. Maintenance of WBM, bituminous surfaces and cement concrete pavements. Pavement evaluation. Benkleman beam. Introduction to various types of overlays.

### **Unit-VI Highway Drainage and Hill Roads**

Surface drainage: types, brief design. Types of sub-surface drainage. Special characteristics of hill roads: geometrics, hair pin bends, construction of hill roads, drainage of hill roads, maintenance problems of hill roads.

## SECTION-D

### **Unit-VII Highway Economics and Finance**

Need of economic evaluation. Highway user benefits and costs. Methods of economic evaluation: benefit cost ratio method, net present value method, internal rate of return method, comparison. Highway finance.

### **Unit-VIII-Tunnels**

Sections of tunnels: advantages, limitations and suitability of each section. Shaft. Pilot tunnel. Driving tunnel in rocks: sequence of construction operations, full-face method, heading and bench method, drift method. Driving tunnels in soft ground: sequence of construction operations, needle beam method, shield tunneling, compressed air tunneling.

#### Books Recommended:

1. Highway Engg by S.K.Khanna & C.E.G. Justo, Nem Chand Bros., Roorkee.
2. Principles and Practice of Highway Engg. by L.R.Kadiyali, Khanna Publishers, Delhi.
3. Principles of Pavement Design by Yoder,E.J & Witczak,M.W., John Wiley and Sons, USA.
4. Tunnel Engineering by S.C.Saxena, Dhanpat Rai Publications, N.Delhi.
5. A text book of Tunnel, Bridges and Railway Engg. by S.P.Bindra, Dhanpat Rai Delhi.

## CE-312 F ENGINEERING GEOLOGY

L T P

3 1 -

Sessional: 50 Marks

Theory : 100 Marks -

Total : 150 Marks

Duration of exam: 3 Hrs.

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

### SECTION-A

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.

Unit-II: Physical Geology: The external and internal geological forces 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.

### SECTION-B

Unit-III: 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, Textures, 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.

Unit-IV: 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.

### SECTION-C

Unit-V: Ground water geology- Hydrogeology, aquifers, 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.

### SECTION-D

Unit-VI: Applied geology-Physio graphic division in India, Suitability and stability of foundation sites and abutments. Geological conditions and their influence on the selection, location, type and design of dams, reservoirs, tunnels, highways, bridges etc.

Unit-VII: Landslides and Hillslope stability. Improvement of foundation rocks, precaution and treatment against faults, joints and ground water, retaining walls and other precautions. Geology and environment of earth.

Books Recommende

- 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 Singh4 Introduction of Physical Geology by A.Holmes.

## CE-314 F GEOTECHNOLOGY LAB

L T P  
- - 2

Sessional: 25 Marks

Exam : 25 Marks -

Total : 50 Marks

Duration of exam: 3 Hrs.

### List of Experiments:

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. Models Plate-Load Test.

### Books Recommended:

1. Soil Testing for Engineers by S.Prakash & P.K.Jain, Nern Chand & Bros.,Roorkee.
2. Engineering Soil Testing by Lambi, Wiley-Eastern.
3. Engineering Properties of Soils & Their Measurement by JE Bowles, McGraw Hill.
4. Soil Engineering in Theory & Practice by Alam Singh, Vol.11, Geotechnical Testing & Instrumentation, CBS Pub.

## CE-316 F TRANSPORTATION ENGINEERING II LAB

L T P

- - 2

Sessional: 25 Marks

Exam : 25 Marks -

Total : 50 Marks

Duration of exam: 3 Hrs.

### List of Experiments:

1. Aggregate Impact Test.
2. Los-Angeles Abrasion Test on Aggregates.
3. Dorry's Abrasion Test on Aggregates.
4. Deval Attrition Test on Aggregates.
5. Crushing Strength Test on Aggregates.
6. Penetration Test on Bitumen.
7. Ductility Test on Bitumen.
8. Viscosity Test on Bituminous Material
9. Softening Point Test on Bitumen.
10. Flash and Fire Point Test on Bitumen.



## **CE 318 F ENGINEERING GEOLOGY LAB**

L T P

- - 2

Sessional: 25 Marks

Exam : 25 Marks -

Total : 50 Marks

Duration of exam: 3 Hrs.

### **List of Experiments**

1. Study of Physical properties of minerals
2. Identification of rocks forming silicate and ore minerals
3. Recognition of rocks
4. Use of clinometers compass and Brunton compass for measurement dip and strike of formations.
5. Geological cross sections and study of geological maps.
6. Study of models of geological structures and out crops patterns of different types of rocks and land forms

## CE -312 F Environmental Engg Lab

L T P  
- - 2

Sessional: 25 Marks  
Exam : 25 Marks -  
Total : 50 Marks  
Duration of exam: 3 Hrs.

### List of experiments

- Based on course work corresponding to Environmental Engineering
- Sampling and analysis of water test like hardness, chloride, sulphate phosphate, D.O, PH, conductivity
- Sampling and analysis of waste water Like D.O ,B.O.D ,C.O.D, Suspended solid
- Measurement of noise level
- Total suspended particulate matters
- Sulphation rate in water samples
- Fluoride measurement in water samples
- High volume and handy samplers