



**CURRICULUM
ON
MASTER LEVEL
ENTRANCE EXAMINATION**

FACULTY OF SCIENCE AND TECHNOLOGY

POKHARA UNIVERSITY

2018

Pokhara University
Faculty of Science and Technology
Entrance Examination Curriculum

Master of Science in Computer Engineering/Computer Science/ Information System Engineering
Total marks: 150 Qualifying marks: 53

Time: 3 hrs

Entrance curriculum mainly covers common topics of all streams covering Mathematics, Physics, Computer and Verbal Ability of Bachelor's level.

Section	Course	Weightage (%)
A	Fundamentals of Mathematics	30
B	Computational Foundation	70
	Total	100

Section A: Fundamental of Mathematics

- 1. Basic of Set, Continuity, Derivative, Vector and Scalar:** Set and functions, limit, continuity and differentiability of functions, Integration by using different integration techniques, standard integrals, definite integrals parts, vectors and scalars, resolution of vectors, scalar and vector product of two and more vectors, gradient, divergence, curl and directional derivative of vectors.
- 2. Linear Algebra:** Definition and basic properties of matrices and determinants Rank of matrix, system of linear equations, inverse of a matrix, Eigen values and Eigen vectors.
- 3. Infinite series:** Definitions of sequence and infinite series, the necessary conditions for convergence of an infinite series, test of convergence, alternating series test.
- 4. Fourier series:** Periodic functions, Fourier series on the functions of period 2π , Euler's formula, Fourier series of a function having arbitrary period, even and odd functions and their Fourier series, half range functions
- 5. Laplace transformation:** Laplace transform, Application of Laplace transform, Inverse Laplace transform, Convolution theorem on Laplace transform and application, Differential equation (ODE and PDE).
- 6. Z-transform:** Definitions, one-sided and two-sided z-transform, linear time invariant system, Unit impulse function, properties of z-transform, region of convergence, inverse z-transform by residue and partial fraction, Parseval theorem, convolution.
- 7. Nonlinear Equations:** Review of calculus and Taylor's theorem, errors in numerical calculations, trial and error method, Bisection method, Newton's method, Secant method
- 8. Introduction of Descriptive Statistics:** Presentation and classification data frequency distribution, histogram, measures of central tendency -mean, median, mode, quartiles and percentiles, measures of dispersion (variability).

Section B: Computational Foundation

- 1. Programming Paradigms:**

C programming:- Procedural programming, structured programming, Object-oriented programming, control structures, function, arrays, pointers, functions, preprocessor directives, C libraries, Macros, Header files and prototyping.

Object-oriented programming:- Classes and Methods, Message, message passing formalization, message passing syntax in C++, mechanism for creation and initialization (constructor and its types), Issues in creation and initialization: memory map, memory allocation methods and memory recovery, Object Inheritance and Reusability, Template and generic programming- template classes, template functions.

2. **Computer Architecture and Organization:** CPU organization, register organization, Instruction cycle, Computer Arithmetic, Instruction sets, addressing modes, Control Unit- hardwired control Unit, micro-programmed control unit, Cache memory- catch principle, mapping catch memory, write policy, replacement algorithms, Input-output organization- programmed I/O, interrupt driven I/O, Direct memory access, RISC vs. CISC, RISC pipelining, parallel processing- parallelism in uni-processor system, multiprocessor system and their characteristics, Flynn's classification, Cache coherence, vector processing and array processor, multi-core organization, dual core and quad core processors.
3. **Operating system and concepts:** Operating system concepts and functionalities, operating system structure, process states and transition, process control block (PCB), inter-process communication, critical regions and conditions, mutual exclusion, Dekker's and Peterson's algorithm, Dead lock, dead-lock avoidance, detection and prevention, threads, advantage of threads, process scheduling techniques, paging, segmentation, Distributed operating system- network architecture, Asynchronous Transfer Mode, Client-Server model.
4. **Object-oriented Software Engineering:** Software process and framework, process models, Agile development, Extreme programming, Scrum, Software modeling, quality management and testing, CMMI.
5. **Database Management System:** Need of DBMS, concept of DDL, DML and DCL, ER Model, UML class diagram, relational algebra, schema and views, SQL, normalization and normal forms, security.

Pokhara University
Faculty of Science and Technology
Entrance Examination Curriculum
Master of Science in Construction Management

Total marks: 150

Qualifying marks: 53

Time: 3 hrs

Entrance curriculum mainly covers common topics of all streams covering Engineering Economics, Project Engineering, Construction Management and Engineering Professional Practice.

Section	Course	Weightage (%)
A	Engineering Economics	30
B	Project Engineering	30
C	Construction Management	30
D	Engineering Professional Practice	10
	Total	100

Section A: Engineering Economics:

Interest and Time Value of Money, Payback Period, Net Present Value, Internal Rate of Return, External Rate of Return, Benefit Cost Analysis, Financial and Economic Analysis, Breakeven Analysis, Sensitivity Analysis, Law of Demand and Supply.

Section B: Project Engineering:

Definition and Characteristics of Project, Project Cycle, Types of Project, Feasibility Analysis, Project Proposal, Bar Chart, CPM, PERT, Resource Levelling, Project Monitoring and Control, Earned Value Analysis, Time Cost Trade off Analysis, Capital Budgeting Techniques, Capital Structure Planning.

Section C: Construction Management:

Construction Management Framework, Material Management, Construction Equipment, Job Layout, Method of Contract, Types of Contract, Request for Proposal, Expression of Interest, Bidding Document, Tender Notice, Bid Evaluation, Conditions of Contract, Contract Document, Running Bill, Project Completion Report, Personnel Management, Project Maintenance, Health and Safety at site.

Section D: Engineering Professional Practice:

Ethics and Profession, Code of Conduct, Professional Associations, Nepal Engineering Council Act, Liability and Negligence, Professional Liability Insurance, Detailed duties of Engineers, Types of Business Organizations, Labor Law, Intellectual Property right.

Pokhara University
Faculty of Science and Technology
Entrance Examination Curriculum
Master of Science in Environmental Management

Total marks: 150

Qualifying marks: 53

Time: 3 hrs

Entrance curriculum mainly covers common topics of all streams covering Critical Reasoning, Mathematics (Quantitative aptitude), General Awareness, Basic content related to Bachelor of Environmental Science, Engineering and Management.

Section	Course	Weightage (%)
A	Verbal Ability	10
B	Fundamental of Mathematics	10
C	General Awareness	10
D	Environmental Management	30
E	Basic Water Supply and Sanitary System	20
F	Environmental Management Issues and Agencies	20
	Total	100

Section A: Verbal Ability:

Article, Voice, Reported speech, Tense Contrast, Events in rapid succession (No sooner...than/had only just...when), Correct form of verbs, Stress/Intonation, Causative verbs, Question tag, Sentence transformation (Negative/Positive, Verbal/Wh etc), Decision and intentions, Suggestions/Advice, AmE/BrE English words, Connectives, Right order/ Wrong order with Tenses, Singular/Plural nouns, Subject verb agreement, Relative clause, Expressing new experience, Co-relative conjunctions, Homophones/homonyms, Sense verbs with bare infinitive and gerund, To +infinitive & gerund, Discovering similarities, Conditional sentence, Requests & Offer, Prepositions, Word formation, Parts of speech, Degrees of Adjectives, Verbs and their forms, Synonyms & Antonyms, Identification of Simple, Compound and Complex sentences, Formal and informal words/sentences, Slang/Colloquial/Derogative words, English language or literature related quotations, Standard academic abbreviations (IELTS, GRE, GMAT, SAT etc), Single word for personality traits, Standard vocabulary (Kleptomania, chauvinism, supercilious, rationalize etc), General Knowledge on current affairs of the globe.

Section B: Fundamental of Mathematics

Basic Mathematics (Numbers: Fractions, Decimals and Percentages; Ratio and Proportion; Roots and Power; Logarithms; Progressions; Elementary Geometry; Elementary Trigonometry; Introductory Set Theory) Algebra (Polynomial, Equations and Inequalities; Simultaneous equations and solutions; Elementary Linear Programming, Vector Algebra); Calculus (limits and continuity, differentiation, integration, ordinary first order linear differential equation, partial differential equation), Introduction of Probability and Statistics, Permutations and Combinations.

Section C: General Awareness:

This section covers the general knowledge of environment, geography, environment / water law and regulations; economics and human development indicators in Nepal, general water supply and sanitary knowledge related to bachelor of science and engineering.

Section D: Environmental Management:

Concept of Environmental Chemistry, Air pollution: sources, types, gaseous and particulate matter, smog, green house effect, acid rain and ozone depletion. Water pollution: types, sources and classification of water pollution, ground water pollution, marine water pollution. Concept of DO, BOD, CODS their effects on flora and fauna. Soil pollution: sources and types – classification of soil pollutants, effects of pollution on soil, to health and productivity. Sewage – municipal sewage, lake/pond, river water.

Section E: Basic Water Supply & Sanitary System:

Sources of water, quantity of water, quality of water, intake works, water treatments- natural, artificial, sedimentation, filtration, disinfection, reservoirs and distribution system, conveyance of water, valves and fittings, quantity of waste water, characteristics and examination of sewage, construction of sewers, sewer appurtenances, sewage disposal, sewage treatment, sludge treatment and disposal, solid waste management and practices in Nepal.

Section F: Environmental Management Issues and Agencies:

National Environmental Protection Guideline, Concept of Environmental System, Environmental Impact assessment process and its requirement. Global / national environmental management issues, agencies, existing National policy and plan for environmental management.

Pokhara University
Faculty of Science and Technology
Entrance Examination Curriculum

Master of Science in Natural Resource Management (NRM)

Total marks: 150

Qualifying marks: 53

Time: 3 hrs

Entrance curriculum mainly covers common topics of all streams covering Critical Reasoning, Mathematics (Quantitative aptitude), General Awareness, Basic content related to Bachelor of Science, Engineering and Management.

Section	Course	Weightage (%)
A	Verbal Ability	10
B	Fundamental of Mathematics	10
C	General Awareness	10
D	Basic Water Science, Engineering and Management	10
E	Environmental Management	25
F	Natural Resource Management	25
G	Environmental and Resource Management Issues and Agencies	10
	Total	100

Section A: Verbal Ability:

Article, Voice, Reported speech, Tense Contrast, Events in rapid succession (No sooner...than/had only just...when), Correct form of verbs, Stress/Intonation, Causative verbs, Question tag, Sentence transformation (Negative/Positive, Verbal/Wh etc), Decision and intentions, Suggestions/Advice, AmE/BrE English words, Connectives, Right order/ Wrong order with Tenses, Singular/Plural nouns, Subject verb agreement, Relative clause, Expressing new experience, Co-relative conjunctions, Homophones/homonyms, Sense verbs with bare infinitive and gerund, To +infinitive & gerund, Discovering similarities, Conditional sentence, Requests & Offer, Prepositions, Word formation, Parts of speech, Degrees of Adjectives, Verbs and their forms, Synonyms & Antonyms, Identification of Simple, Compound and Complex sentences, Formal and informal words/sentences, Slang/Colloquial/Derogative words, English language or literature related quotations, Standard academic abbreviations (IELTS, GRE, GMAT, SAT etc), Single word for personality traits, Standard vocabulary (Kleptomania, chauvinism, supercilious, rationalize etc), General Knowledge on current affairs of the globe.

Section B: Fundamental of Mathematics

Basic Mathematics (Numbers: Fractions, Decimals and Percentages; Ratio and Proportion; Roots and Power; Logarithms; Progressions; Elementary Geometry; Elementary Trigonometry; Introductory Set Theory) Algebra (Polynomial, Equations and Inequalities; Simultaneous equations and solutions; Elementary Linear Programming, Vector Algebra); Calculus (limits and continuity, differentiation, integration, ordinary first order linear differential equation, partial differential equation), Introduction of Probability and Statistics, Permutations and Combinations.

Section C: General Awareness:

This section covers the general knowledge of environment, geography, environment / water law and regulations; economics and human development indicators in Nepal, general physics and chemistry knowledge related to bachelor of science and engineering.

Section D: Basic Water Science, Engineering and Management:

Physical properties, Fluid pressure, Equilibrium stability of floating bodies, Fluid kinematics, Classification of fluid flow, Dynamics of flows, Euler's equation, Bernoulli's equation, Navier stokes equation Boundary layer theory, Momentum equation, Open channel flow, Uniform and Non uniform flow, Energy & momentum principle for open channel flow, Flow in mobile boundary channel, Flow over notches & weirs, Gradually varied flow, Hydraulic Jump and its analysis, Similitude and physical modeling, Physical hydrology, Surface runoff, Rainfall-runoff correlation, Hydrograph Analysis, Unit hydrographs, Peak flow estimation.

Section E: Environmental Management:

Concept of Environmental Chemistry, Air pollution: sources, types, gaseous and particulate matter, smog, green house effect, acid rain and ozone depletion. Water pollution: types, sources and classification of water pollution, ground water pollution, marine water pollution. Concept of DO, BOD, CODS their effects on flora and fauna. Soil pollution: sources & types – classification of soil pollutants, effects of pollution on soil, to health and productivity. Sewage – municipal sewage, lake/pond, river water.

Section F: Natural Resources Management:

Natural resources and associated problems, Forest / mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems. Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Land resources: land as a resource, land degradation, man induced landslides. Conventions related to global warming, climate change and ozone depletion.

Section G: Environmental and Resources Management issues and Agencies:

National Environmental Protection Guideline, Concept of Environmental System, Environmental Impact assessment process and its requirement. Global / national resources management issues, agencies. National policy and plan for natural resources, environmental management.

Pokhara University
Faculty of Science and Technology
Entrance Examination Curriculum

Master of Science in Interdisciplinary Water Resources Management (IWRM)

Total marks: 150

Qualifying marks: 53

Time: 3 hrs

Entrance curriculum mainly covers common topics of all streams covering Critical Reasoning, Mathematics (Quantitative aptitude), General Awareness, Basic content related to Bachelor of Civil Engineering, Environmental Engineering and Resources and equivalent.

Section	Course	Weightage (%)
A	Verbal Ability	10
B	Fundamental of Mathematics	10
C	General awareness	10
D	Basic water science, engineering and hydrology	30
E	Water supply and sanitary engineering	30
F	Water and environmental issues	10
	Total	100

Section A: Verbal Ability:

Article, Voice, Reported speech, Tense Contrast, Events in rapid succession (No sooner...than/had only just...when), Correct form of verbs, Stress/Intonation, Causative verbs, Question tag, Sentence transformation (Negative/Positive, Verbal/Wh etc), Decision and intentions, Suggestions/Advice, AmE/BrE English words, Connectives, Right order/ Wrong order with Tenses, Singular/Plural nouns, Subject verb agreement, Relative clause, Expressing new experience, Co-relative conjunctions, Homophones/homonyms, Sense verbs with bare infinitive and gerund, To +infinitive & gerund, Discovering similarities, Conditional sentence, Requests & Offer, Prepositions, Word formation, Parts of speech, Degrees of Adjectives, Verbs and their forms, Synonyms & Antonyms, Identification of Simple, Compound and Complex sentences, Formal and informal words/sentences, Slang/Colloquial/Derogative words, English language or literature related quotations, Standard academic abbreviations (IELTS, GRE, GMAT, SAT etc), Single word for personality traits, Standard vocabulary (Kleptomania, chauvinism, supercilious, rationalize etc), General Knowledge on current affairs of the globe.

Section B: Fundamental of Mathematics:

Basic Mathematics (Numbers: Fractions, Decimals and Percentages; Ratio and Proportion; Roots and Power; Logarithms; Progressions; Elementary Geometry; Elementary Trigonometry; Introductory Set Theory) Algebra (Polynomial, Equations and Inequalities; Simultaneous equations and solutions; Elementary Linear Programming, Vector Algebra); Calculus (limits and continuity, differentiation, integration, ordinary first order linear differential equation, partial differential equation), Introduction of Probability and Statistics, Permutations and Combinations.

Section C: General Awareness:

This section covers the general knowledge of environment, geography, environment / water law and regulations; economics and human development indicators in Nepal, general physics and chemistry knowledge related to bachelor of science and engineering.

Section D: Basic Water Science, Engineering and Hydrology:

Physical properties, Fluid pressure, Equilibrium stability of floating bodies, Fluid kinematics, Classification of fluid flow, Dynamics of flows, Euler's equation, Bernoulli's equation, Navier stokes equation Boundary layer theory, Momentum equation, Open channel flow, Uniform and Non uniform flow, Energy & momentum principle for open channel flow, Flow in mobile boundary channel, Flow over notches & weirs, Gradually varied flow, Hydraulic Jump and its analysis, Similitude and physical modeling, Physical hydrology, Surface runoff, Rainfall-runoff correlation, Hydrograph Analysis, Unit hydrographs, Peak flow estimation, measurement of flow, hydrology and climatology

Section E: Basic Water Supply & Sanitary Engineering:

Sources of water, quantity of water, quality of water, intake works, water treatments- natural, artificial, sedimentation, filtration, disinfection, reservoirs and distribution system, conveyance of water, valves and fittings. quantity of waste water, characteristics and examination of sewage, design and construction of sewers, sewer appurtenances, sewage disposal, sewage treatment, sludge treatment and disposal, solid waste management and practices in Nepal.

Section F: Water and Environmental Issues:

National Environmental Protection Guideline, Concept of Environmental System, Environmental Impact assessment process and its requirement. Global water and climate issue, major agencies/organizations working on it. National policy and plan for water resource management. Agencies / Institutions working for water resources development and management in Nepal.

Pokhara University
Faculty of Science and Technology
Entrance Examination Curriculum

Master of Science in Transportation Engineering and Management

Total marks: 150

Qualifying marks: 53

Time: 3 hrs

Entrance curriculum mainly covers common topics of all streams covering Transportation Engineering and Management, Engineering Professional Ethics and content related to Bachelor of Civil Engineering and equivalent.

Section	Course	Weightage (%)
A	Transportation Engineering	60
B	Soil Mechanics and Highway Materials	20
C	Engineering Professional Ethics	20
	Total	100

Section A: Transportation Engineering:

1. Traffic Engineering and probability and statistics:

- Traffic Study: traffic volume, parking, speed, accident study, Traffic characteristics,
- Traffic control devices,
- Highway capacity,
- Street lighting, intersection design
- Concepts of probability, mean, standard deviation, variation, Poisson's Binomial distribution, Normal distribution, sampling theory, linear regression and correlation

2. Highway Design:

- Geometric design of highways: design criteria,
- Design of cross-sections, vertical and horizontal alignment
- Hill roads
- Design of side drains

3. Pavement design and construction:

- Traffic consideration,
- Design procedures for Flexible and rigid pavement,
- Road Construction activities: preparation of sub-grade for cut and fill embankment section
- Construction of bituminous pavement
- Construction of rigid pavement

Section B: Soil Mechanics and Highway Materials:

1. Soil Mechanics

- Classification and identification of soil
- Phase relationship
- Theory of compaction
- Active and passive pressure

- Soil consolidation
- General Bearing Capacity theories
- Ground Improvement techniques

2. Highway Materials:

- Subgrade soil,
- Stone aggregates,
- Bituminous materials,
- Bituminous mixes
- Cement and cement concrete

Section C: Engineering Professional Practice:

- Ethics and Profession
- Code of Conduct
- Professional Associations
- Nepal Engineering Council Act
- Liability and Negligence
- Professional Liability Insurance
- Detailed duties of Engineers
- Types of Business Organizations
- Labor Law
- Intellectual Property right

Pokhara University
Faculty of Science and Technology
Entrance Examination Curriculum
Master of Science in Structural Engineering

Total marks: 150

Qualifying marks: 53

Time: 3 hrs

Entrance curriculum mainly covers common topics of all streams covering Mathematics (Quantitative aptitude), Soil Mechanics and Foundation Engineering, Concrete Technology and Masonry Structures and all Structural Engineering related subject contents of bachelor in Civil Engineering and equivalent.

Section	Course	Weightage (%)
A	Fundamental of Mathematics	10
B	Soil Mechanics and Foundation Engineering	15
C	Applied Mechanics and Strength of Materials	15
D	Structural Analysis	20
E	Design of RCC Structure	20
F	Design of Steel and Timber Structure	10
G	Concrete Technology and Masonry Structures	10
	Total	100

Section A: Fundamental of Mathematics

1. **Basic of Set, Continuity, Derivative, Vector and Scalar:** Set and functions, limit, continuity and differentiability of functions, Integration by using different integration techniques, standard integrals, definite integrals parts, vectors and scalars, resolution of vectors, scalar and vector product of two and more vectors, gradient, divergence, curl and directional derivative of vectors.
2. **Linear Algebra:** Definition and basic properties of matrices and determinants Rank of matrix, system of linear equations, inverse of a matrix, Eigen values and Eigen vectors.
3. **Infinite series:** Definitions of sequence and infinite series, the necessary conditions for convergence of an infinite series, test of convergence, alternating series test.
4. **Fourier series:** Periodic functions, Fourier series on the functions of period 2π , Euler's formula, Fourier series of a function having arbitrary period, even and odd functions and their Fourier series, half range functions
5. **Laplace transformation:** Laplace transform, Application of Laplace transform, Inverse Laplace transform, Convolution theorem on Laplace transform and application, Differential equation (ODE and PDE).
6. **Z-transform:** Definitions, one-sided and two-sided z-transform, linear time invariant system, Unit impulse function, properties of z-transform, region of convergence, inverse z-transform by residue and partial fraction, Parseval theorem, convolution.
7. **Nonlinear Equations:** Review of calculus and Taylor's theorem, errors in numerical calculations, trial and error method, Bisection method, Newton's method, Secant method.
8. **Introduction of Descriptive Statistics:** Presentation and classification data frequency distribution, histogram, measures of central tendency -mean, median, mode, quartiles and percentiles, measures of dispersion (variability).

Section B: Soil Mechanics and Foundation Engineering:

1. Soil Mechanics:

Unique nature of soils, soil formation processes and type of soils, phase relations, index properties of soils, Nepal standard soil classification system, Effective stress equation for saturated soils, practical significance of effective stress, capillary phenomenon in soils, capillary head and capillary pressure, computation of effective stress for “no flow” and “flow” conditions, seepage force and quick sand condition, total pressure and elevation heads, permeability of soils, recapitulation of Darcy’s law, process of compaction and compaction theories, moisture density relationship and degree of compaction, effect of compaction on engineering behavior of soils, stress history and effective stress on compressibility, factors affecting consolidation and compressibility parameters; Normally consolidated and over consolidated soils, Trazaghi theory of one dimensional consolidation and time-rate consolidation, concept of shear strength, stress at a point and Mohr’s stress circle, Mohr-Coulomb failure criteria, relation between principle stresses at failure, effective stress and total stress, causes of instability in slopes, modes of failure, infinite slopes and concepts of factors of safety, stability analysis of finite slopes- methods of slices, Bishop’s simplified method, acceptable values of factors of safety, stability of earth dam slopes-critical conditions and approximate analyses, friction circle method and Taylo’s stability number.

2. Foundation Engineering:

Methods of soil exploration, boring, sampling, types of samplers and samples, standard penetration test, Static and Dynamic cone tests, correlations between penetration resistance and strength parameters, plate load test, number of bore holes, depth of exploration, earth pressure at rest, active and passive earth pressure computations using Rankine's and Coulomb's earth pressure theories, Culmann's graphical construction, stability analysis for various types of retaining walls, sheet pile walls, cantilever and anchored sheet pile walls, bracings for open cuts - Recommended design diagrams of earth pressure for typical soils, calculation of strut loads, theory of arching and its practical implications, review of major soil parameters used in the proportioning of foundations, types of shallow foundations and their selection, bearing capacity, Terzaghi's bearing capacity theory, computation of bearing capacity in cohesionless and cohesive soils, Skempton's equations; Effect of various factors on bearing capacity; Use of field test data; Generalize a bearing capacity equations, Settlement - Components of settlement; Limits of settlement; Total settlement, concept of compensated/ floating raft, conventional method for design of raft foundation, piles: Outline of steps involved in the proportioning of pile foundations, Estimation of load carrying capacity of piles using pile load formulas, pile driving formulas, penetration tests and pile load tests, Group action of piles in sand and clay, bearing capacity and settlement of group of piles; Negative skin friction, construction of pile foundation, well foundation, construction of well foundation, tilt and shift of well foundation, proportioning - depth and size of wells on the basis of scour depth, bearing capacity and settlement, machines and their foundations.

Section C: Applied Mechanics and Strength of Materials:

1. Resolution and composition of forces
2. Principles of transmissibility and equivalent forces
3. Resultant of force and moment for a system of force
4. Equation of Equilibrium in Two/Three Dimensions
5. Moment of Inertia, polar moment of inertia, moment of inertia of composite and built up section
6. Position, velocity and acceleration of a particle and rigid body
7. Rectilinear and curvilinear motion of particles
8. Rectangular components of velocity and acceleration
9. Tangential & normal components and radial and transverse components
10. Equations of Motion, Motion due to central force and dynamic equilibrium
11. Undamped free vibration, simple harmonic motion, frequency and period of oscillation
12. Centroids of composite and built up section
13. Axial loading, normal stress, normal strain and Hooke's law
14. Transverse loading, shear stress, shear strain and their relationship
15. Poisson's ratio, volumetric strain, bulk modulus and Generalized Hooke's law, Deformation of axially loaded bars, Temperature effect
16. Analysis of axial force, shear force and bending moment diagrams for plane frame
17. Equations for transformation of plane stress and strain
18. Principal strains, Maximum shear strains and their planes
19. Beams of uniform and symmetric cross section in pure bending
20. Normal and shearing stress due to bending
21. Analysis of torsional stress in solid circular section and their deformations

Section D: Structural Analysis:

1. Static and kinematic indeterminacy of 2D and 3D structures
2. Strain energy due to axial force, shear force, bending moment and torsion
3. Displacement of structures by strain energy method, unit load method, castigliano's method, integration method, conjugate beam method, moment area method
4. Determination of maximum and absolute maximum shear force and bending moment using ILD method
5. Axial force, shear force and bending moment diagrams in three hinged parabolic and circular arch
6. Analysis of parabolic cables
7. Analysis of three-hinged stiffened girder
8. Analysis of indeterminate structures by consistent deformation method, slope deflection method, flexibility method, stiffness matrix, and direct stiffness matrix

Section E: Design of RCC Structures:

1. Differences between Working Stress Method, Ultimate Load Method and Limit State Method
2. IS 456-2000 requirement for RCC structural design

3. Limit State Method (LSM) based on IS Code: Partial safety factors, Characteristics strength and loads, Design strengths of materials, Assumptions made on LSM, Analysis and design of singly and doubly reinforced section, Flexural design, Shear design, torsional design
4. Detail analysis and design of one way and two way slabs, simply supported beam, Continuous slab/beam, Cantilever beam/slab with LSM
5. Detail analysis and design of different types of short and slender columns with LSM
6. Detail design of isolated, combined and raft footings with LSM

Section F: Design of Steel and Timber Structures:

1. Design methods of Steel Structure (i.e. LSM and WSM)
2. Analysis of Bolted and Welded joint
3. Net cross sectional area of tension member.
4. Design concept of Tension and Compression Member (LSM)
5. Design concept of lug angles (LSM)
6. Design concept of lacing and battens (LSM)
7. Column splices and column bases (LSM)
8. Stiffened and unstiffened steel beam (LSM)
9. Elements of Plate Girder
10. Load on roof truss and Design of Purlin (LSM)
11. Timber beam and column (WSM)

Section G: Concrete Technology and Masonry Structures:

1. Introduction of concrete and its ingredients: Cement, Aggregates, water, mineral admixtures and chemical admixtures (sources, composition, processing, quality checks and their effect on quality of concrete)
2. Mix design methods (Nominal, DOE and IS standard design methods)
3. Methods and required quality control on selection of ingredients, batching, mixing, transportation, placing, compaction, curing in normal as well as in extreme weather
4. Different types of concrete: Ordinary concrete, Light weight concrete, Heavy weight concrete, Self compacting concrete, Shotcrete, Fibre reinforced concrete, polymer concrete, Latex-modified concrete, Ferrocement concrete, Vacuum concrete, Sulphate infiltrated concrete
5. Properties of hardened concrete: Hydration and strength gaining process, modulus of elasticity, transition zone, inter-relationship between strength-porosity-gel/space ratio-W/C ratio, creep and shrinkage, fatigue and impact, different types of strengths with their inter-relationships and their respective testing methods including non-destructive tests, grade of concrete and its determination method based on IS
6. Durability of concrete: permeability, Alkali-aggregate reaction, Rusting of reinforcement bars and Chemical attack
7. Load bearing and non load bearing masonry structures
8. Reinforced and unreinforced masonry structures
9. In-plane and out-plane behavior of masonry walls
10. Failure behavior of masonry wall in lateral loads
11. Diagonal and NDT of masonry elements