

CERTIFICATE
OF
VOCATIONAL EDUCATION
EXAMINATION (YEAR12)



**SYLLABUS FOR
CIVIL ENGINEERING TECHNICIAN**

Correspondence should be addressed to

**THE CHIEF EXECUTIVE & SECRETARY
COUNCIL FOR THE INDIAN SCHOOL CERTIFICATE EXAMINATIONS**
P-35,36 Sector VI
Pushp Vihar
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New Delhi – 110017

The certificate course in **CIVIL ENGINEERING TECHNICIAN (CET)** is equivalent to Class XII, having the added advantage of providing the students a knowledge of the basic concepts of Civil Engineering.

A successful candidate has two options available to him:

1. To become a small-scale Entrepreneur and execute Civil Engineering Contracts.
2. To find suitable employment in the construction industry.

A successful candidate, if interested, has a third option of taking up higher studies in Civil Engineering by joining the Institution of Engineers (India) as a student member.

Eligibility Criteria:

The eligibility criteria for taking admission in CVE 12 Examination are as follows:

1. Age: 16 to 25 years
2. Must have passed Class X Examination from a recognised board with English, Science and Mathematics as compulsory subjects

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CLASS XI – SUBJECT STRUCTURE & MARKING SCHEME

Sl.No	NAME OF THE SUBJECT	Internal Marks	External Assessment	Total Marks	Pass Criteria (%)
1	English	30	70	100	35
2	General Foundation, Industrial Sociology & Entrepreneurship	30	70	100	35
3	Engineering Physics	30	70	100	35
4	Engineering Chemistry	30	70	100	35
5	Applied Mathematics	30	70	100	35
6	Building Material & Construction	30	70	100	35
7	Fundamentals of Computer	30	30 + 40	100	35
8	Civil Engineering Drawing I	30	70	100	35
10	Engineering Lab	30	70	100	50

Note:

FUNDAMENTALS OF COMPUTER- There will a project of 30 marks and an examination of 40 marks to be conducted by the Council.

CLASS XII – SUBJECT STRUCTURE & MARKING SCHEME

Sl. No.	NAME OF THE SUBJECT	Internal Marks	External Assessment	Total Marks	Pass Criteria (%)
1	English	30	70	100	35
2	General Foundation, Industrial Sociology & Entrepreneurship	30	70	100	35
3	Costing, Contracts & Valuation	30	70	100	35
4	Surveying	30	70	100	35
5	Construction Technology	30	70	100	35
6	Civil Engineering Drawing II	30	70	100	35
7	Civil Engineering Lab	30	70	100	50

CIVIL ENGINEERING TECHNICIAN

AIMS

On successful completion of the course, the technician will have knowledge of the following:

- i) Properties of concrete ingredients.
- ii) Soil properties.
- iii) Tendering, tender documents and rules of Civil Engineering Contracts
- iv) Valuation of a building
- v) Plumbing and ventilation
- vi) Different materials used in Civil Construction works
- vii) Finding out the depth of the foundation required for a building construction
- viii) Carpentry, welding, fitting shop, plumbing and sheet metal shop
- ix) Building estimates and bar bending schedule
- x) Testing bricks, cement, fine aggregates and coarse aggregates

CIVIL ENGINEERING

TECHNICIAN

SYLLABUS FOR CLASS XI

English
Class XI

Examination Duration: 3 Hours

S. No.	Name of the Topic	No. of Hours
	GRAMMAR	
1	Sentences	6
2	Subject & Predicate	6
3	Parts of Speech	20
4	Phrases & Clauses	9
5	Simple, Compound & Complex Sentences	10
6	Tenses	12
7	Formal Letter Writing	12
	LITERATURE	
1	The Eyes Have It	6
2	Job Hunting	6
3	Benjamin Franklin	6
4	The Martyr's Corner	6
5	Life History of Abdul Kalam	6
TOTAL NUMBER OF HOURS		105

General Foundation, Industrial Sociology and Entrepreneurship

Class XI

Examination Duration: 3 Hours

S. No.	Name of the Topic	No. of Hours
1	Personality Development	13
2	Human and Industrial Relationship	15
3	Developing Coping Mechanisms	15
4	Motivation	10
5	Professional Ethics	12
6	Developing Fitness for a Job	15
TOTAL NUMBER OF HOURS		80

1. Personality Development:

- 1.1** Self-esteem
- 1.2** Self-concept
- 1.3** Self-acceptance

2. Human and Industrial Relations:

- 2.1** Human relations and performance in organisation
- 2.2** Understand self and others for effective behaviour
- 2.3** Behaviour modification techniques
- 2.4** Industrial relations and disputes
- 2.5** Relations with subordinates, peers & superiors
- 2.6** Characteristics of group behaviour and trade unions

3. Developing Coping Mechanisms:

- 3.1** Coping with loneliness
- 3.2** Coping with depression
- 3.3** Coping with fear
- 3.4** Coping with shyness
- 3.5** Coping with anger
- 3.6** Coping with failure
- 3.7** Coping with criticism
- 3.8** Coping with conflicts
- 3.9** Coping with change

3.10 Coping with study

3.11 Substance abuse

3.12 Mass media

4. Motivation:

4.1 Factors determining motivation

4.2 Characteristics of motivation

4.3 Methods of improving motivation

5. Professional Ethics:

5.1 Concept of ethics

5.2 Concept of professionalism

5.3 Need for professional ethics

6. Developing fitness for a job:

6.1 Leadership

6.2 Team work

6.3 Career guidance

6.4 Work environment

Engineering Physics

Class XI

Examination Duration: 3 Hours

S. No.	Name of the Topic	No. of Hours
1	Units	5
2	Mass, Weight & Density	15
3	Rest & Motion	20
4	Work, Power & Energy	18
5	Moments, Lever and Centre of Gravity	18
6	Heat & Temperature	24
7	Friction	15
TOTAL NUMBER OF HOURS		115

1. Units:

- 1.1 Introduction
- 1.2 Definition of Unit
- 1.3 System of Units (CGS, MKS & FPS)
- 1.4 Physical Quantity
- 1.5 Fundamental Units
- 1.6 SI Derived Units
- 1.7 Inter relation between Metric & British System of Units

2. Mass, Weight & Density:

- 2.1 Mass
- 2.2 Weight
- 2.3 Differences between mass & weight of a substance
- 2.4 Density
- 2.5 Relative Density
- 2.6 Differences between Density & Relative Density
- 2.7 Archimedes' Principle
- 2.8 Finding out the relative density of the substances using Archimedes' Principle
- 2.9 Buoyancy, Law of Floatation & Centre of Floatation
- 2.10 Hydrometer, Nicholson's Hydrometer and related numerical

3. Rest & Motion:

- 3.1 Rest & Motion
- 3.2 Laws of Inertia
- 3.3 First Law of Motion
- 3.4 Momentum
- 3.5 Second Law of Motion
- 3.6 Third Law of Motion
- 3.7 Vector Quantity
- 3.8 Scalar Quantity
- 3.9 Speed & Velocity
- 3.10 Differences between speed & velocity
- 3.11 Acceleration
- 3.12 Equation of motion
- 3.13 Motion under the force of gravity

4. Work, Power & Energy:

- 4.1 Work
- 4.2 Work represented by an area or diagram of force
- 4.3 Work done by an oblique force
- 4.4 Torque
- 4.5 Power
- 4.6 Horse power of engines
- 4.7 Power required for rotation & determination of the output power of a machine by means of a brake system
- 4.8 Efficiency of a machine
- 4.9 Energy – its uses & application
- 4.10 Types of energy – Potential & Kinetic with their application
- 4.11 Principle of conservation of energy
- 4.12 Other forms of energy
- 4.13 Transmission of power by belt pulley drive
- 4.14 IHP of steam and petrol engine
- 4.15 Electrical Power & Energy

5. Moments, Lever and Centre of Gravity:

- 5.1 Moments – Its definition
- 5.2 Arm of Couple
- 5.3 Moment of Couple
- 5.4 Lever – Its definition, types, application & order
- 5.5 Bell Crank Lever
- 5.6 Application of the principle of moments
- 5.7 Centre of Gravity

5.8 Stable, Unstable and Neutral Equilibrium

6. Heat & Temperature:

- 6.1 Heat – Its definition
- 6.2 Temperature – Its definition
- 6.3 Differences between heat and temperature
- 6.4 Temperature scale (Celsius, Fahrenheit & Kelvin)
- 6.5 Relationship between Celsius, Fahrenheit & Kelvin Scales
- 6.6 Boiling point, Melting point and Specific heat
- 6.7 Transmission of heat, conduction, convection and radiation
- 6.8 Heat transfer in mixture, Calorimeter and latent heat of fusion, vapour
- 6.9 Thermos flask, Pyrometer, Thermocouple, thermoelectric pyrometer
- 6.10 Calorific values of fuel

7. Friction:

- 7.1 Definition
- 7.2 Advantages and Disadvantages of Friction
- 7.3 Normal Reaction, Limiting Friction and Laws of limiting friction
- 7.4 Co-efficient of Friction
- 7.5 Angle of Friction & Angle of Repose and its relationship
- 7.6 Force of Friction when the force is horizontal and when the force is inclined
- 7.7 Lubrication for the control of friction

Engineering Chemistry
Class XI

Examination Duration: 3 Hours

S. No.	Name of the Topic	No. of Hours
1	Introduction to Periodic Table	14
2	States of matter	10
3	Physical and Chemical changes	14
4	Air	6
5	Water	10
6	Acid, Base & Salt	18
7	Metals & Non-metals	8
TOTAL NUMBER OF HOURS		80

1. Introduction to Periodic Table:

- 1.1 General Symbols, Atomic Numbers and Atomic Structure
- 1.2 Introduction to the different elements
- 1.3 General Plan for Periodic Table
- 1.4 Periodic Table & its modern form
- 1.5 Periodic trend in physical properties
- 1.6 Valence Electron, Valency, Variation of Atomic Size

2. States of matter:

- 2.1 Detailed study of substance
- 2.2 Molecular, atoms, solids- liquids- gases
- 2.3 Inter- conversion
- 2.4 Elements, compounds, mixture - separation, boiling, freezing, melting, condensation, evaporation, chromatography, distillation and uses

3. Physical and Chemical changes:

- 3.1 Different types of reactions- (exothermic, endothermic, combination, decomposition, displacement, oxidation and reduction)
- 3.2 Temporary and Permanent changes
- 3.3 Illustration & examples

- 4. Air:**
 - 4.1 Composition & Properties
 - 4.2 Uses of components & its separation
 - 4.3 Pollution & preventive measures
- 5. Water:**
 - 5.1 Pure & Impure water
 - 5.2 Natural and Potable water
 - 5.3 Distilled water
 - 5.4 Soft and Hard water
 - 5.5 Techniques of removing hardness
 - 5.6 Uses of Water
 - 5.7 Pollution
 - 5.8 Contract measure & conservation
- 6. Acid, Base & Salt:**
 - 6.1 Introduction
 - 6.2 Acids – Classification depending on different factors like source, chemical compound
 - 6.3 General properties of an acid
 - 6.4 Bases – Classification depending on different factors like acidity of bases and concentration
 - 6.5 General properties of bases
 - 6.6 Neutralisation
 - 6.7 Some basic uses of acid and bases
 - 6.8 Salts – Classification depending on different factors
 - 6.9 Solubility of salts
 - 6.10 Properties of Salts
- 7. Metals & Non-metals:**
 - 7.1 Introduction to the topic
 - 7.2 Physical Properties of Metals and Non-metals
 - 7.3 Chemical Properties of Metals & Non- metals
 - 7.4 Occurrence of metals
 - 7.5 Activity series of metals
 - 7.6 Extraction of metals
 - 7.7 Iron & Steel – Introduction, Occurrence & Properties
 - 7.8 Product from the Blast Furnace – Pig Iron
 - 7.9 Cast iron and its occurrence
 - 7.10 Alloy Steel
 - 7.11 Different types of metals (Ferrous & Non-Ferrous) and its properties and household applications
 - 7.12 Other Alloys – Composition & Uses
 - 7.13 Some properties and uses of non-metals

Applied Mathematics
Class XI

Examination Duration: 3 Hours

S. No.	Name of the Topic	No. of Hours
1	Units	4
2	General Simplification	6
3	Ratio & Proportion	4
4	Percentage	5
5	Algebra	12
6	Logarithm	6
7	Indices	8
8	Equations	14
9	Factorization	10
10	Properties of Triangle, Circle & Polygons	6
11	Mensuration	20
12	Trigonometry (Ratio & Identities)	10
TOTAL NUMBER OF HOURS		105

1. Units:

- 1.1 Introduction
- 1.2 Definitions
- 1.3 Classification of units
- 1.4 Conversion of the basic mechanical units

2. General Simplification:

- 2.1 Introduction
- 2.2 Fractions & Decimal Fractions
- 2.3 LCM & HCF
- 2.4 Multiplication and division of decimals
- 2.5 Conversion of fraction from one to another
- 2.6 Multiplication of fraction with numbers like 10, 100, 1000
- 2.7 Some more methods of converting fractions

3. Ratio & Proportion:

- 3.1** Ratio
- 3.2** Proportion
- 3.3** Relationship between Ratio & Proportion

4. Percentage:

- 4.1** Introduction
- 4.2** Conversion of decimal to percentage and vice versa
- 4.3** Profit & Loss

5. Algebra:

- 5.1** Introduction
- 5.2** Careful consideration of subject items
- 5.3** Addition and Subtraction
- 5.4** Multiplication and Division
- 5.5** Algebraic formulae
- 5.6** Proofs

6. Logarithm:

- 6.1** Introduction
- 6.2** Definition of different terms used in logarithms
- 6.3** Laws of Logarithm
- 6.4** How to refer to a log table
- 6.5** Negative characteristic
- 6.6** Relationship between log and antilog
- 6.7** How to refer to antilog table
- 6.8** Rules while using logarithm
- 6.9** Addition, subtraction, multiplication & division using indices

7. Indices:

- 7.1** Exponent and multiplication
- 7.2** The laws of indices
- 7.3** Zero and negative integral indices
- 7.4** Fractional Indices
- 7.5** Exponential Equations

8. Equations:

- 8.1** Equations & Root
- 8.2** Solving linear equation with one variable

- 8.3 Solving problems using equations
- 8.4 Number Problems, Age Problems, Mensuration Problems
- 8.5 Solving simultaneous linear equation
- 8.6 Method of elimination by addition and subtraction
- 8.7 Word problem involving simultaneous equation
- 8.8 Quadratic Equations – Problems on Quadratic Equation

9. Factorization:

- 9.1 Factorizing polynomials
- 9.2 Factorization of a perfect square trinomial – e.g. $(4x^4 + 12x^2 + 9)$
- 9.3 Factorizing the difference of two squares
- 9.4 Trinomials
- 9.5 Factorization using the middle term factor
- 9.6 Problem solving based on factorization

10. Properties of Angle, Triangle, Circle and Polygons:

- 10.1 Introduction
- 10.2 Different properties related to the angular properties of the triangle
- 10.3 Different types of triangles
- 10.4 Median and Altitudes
- 10.5 Mid-Point theorem of the triangle
- 10.6 Circle - Elements
- 10.7 Properties of the circle – Arc, Sector, Segment, Chord and Tangent
- 10.8 Polygons – Types and Features
- 10.9 Method of finding the internal and external angle of polygons

11. Mensuration:

- 11.1 Introduction to the topic
- 11.2 Formulae for various Plane and irregular figures (Area, perimeter and volume)
- 11.3 Area and Perimeter of Plane Figures like Rectangle, Square, Area of four walls, Triangle, Parallelograms, Rhombus, Trapezium, Circle
- 11.4 Surface area of different solid figures
- 11.5 Volume of different Solid figures
- 11.6 Volume of the metal that is removed from different machining process

12. Trigonometry:

- 12.1 Introduction to Trigonometry
- 12.2 Notation for angle
- 12.3 Trigonometrical Ratio
- 12.4 Reciprocal ratios
- 12.5 Understanding of the different sides of the triangle based on given angle
- 12.6 Understanding the use of Trigonometrical table for finding different angles

Building Material & Construction

Class XI

Examination Duration: 3 Hours

Group	Module	Name of the Topic	No. of Hours
A (Building Materials)	1	Bricks and Tiles	10
	2	Stones	4
	3	Lime and Lime products	4
	4	Sand	4
	5	Cement	8
	6	Mortar	4
	7	Concrete	10
	8	Timber	8
	9	Metals and other Engineering Materials	4
	10	Paints and Varnishes	4
B (Building Construction)	11	Construction Planning and Storage of Materials	4
	12	Foundation	6
	13	Brick and Stone masonry	8
	14	Damp Proofing	6
	15	Lintel and Arches	6
	16	Roofs and Roof Coverings	6
	17	Doors and Windows	6
	18	Scaffolding	4
	19	Stairs and Stair Cases	4
	20	Flooring	6
	21	Wall Finish	4
TOTAL NUMBER OF HOURS			120

Group – A BUILDING MATERIALS

1. Bricks and Tile:

- 1.1 Manufacture
- 1.2 Classification
- 1.3 Quality Requirements

2. Stones:

- 2.1 Sources
- 2.2 Classification:
- 2.3 Geological, physical & chemical features with examples and uses
- 2.4 Strength and tests
- 2.5 Quality Requirement

3. Lime and Lime Products:

- 3.1 Classification of lime
- 3.2 Properties and specific uses
- 3.3 Slaking and setting of lime

4. Sand:

- 4.1 Sources of sand - Pit, River & Sea
- 4.2 Coarse, medium & fine sand with their uses
- 4.3 Characteristics of good quality sand for mortar and concrete work
- 4.4 Function of sand in mortar and concrete
- 4.5 Bulking of sand

5. Cement:

- 5.1 Definition of Portland Cement
- 5.2 Ingredient of Portland Cement
- 5.3 Common Proportion and their functions
- 5.4 **Different types of Cement:** Ordinary Portland Cement:
 - a) Rapid hardening cement
 - b) Low heat Portland cement
 - c) Blast furnace slag cement
 - d) Pozzolona cement
 - e) High strength cement
 - f) Sulphate resisting cement
 - g) White & coloured cement (Properties and uses only)
 - h) Different grades of cement

6. Mortar:

- 6.1 Cement & Sand mortar
- 6.2 Usual proportions and specific uses
- 6.3 Lime surkhi & mortar
- 6.4 Lime, Sand, & mortar
- 6.5 Usual proportions and specific uses
- 6.6 Composite mortar
- 6.7 Usual proportions and specific uses

- 6.8 Mud mortar
- 6.9 Composition and use

7. Concrete:

- 7.1 Definition and chief ingredients of concrete
- 7.2 Lime concrete
- 7.3 Ingredients used and their qualities
- 7.4 Different mix proportions and their specific uses in construction
- 7.5 **Cement Concrete -**
 - 7.5.1 Coarse and fine aggregate, recommended size of coarse aggregate of various concrete work
 - 7.5.2 Characteristic of coarse and fine aggregate
 - 7.5.3 Binding materials characteristic of good quality coarse aggregate
 - 7.5.4 Characteristics of good quality fine aggregate
 - 7.5.5 Grading and fineness modulus
- 7.6 **Specification and Function of Water in Concrete-** slump of concrete – its determination and recommended values for various works
- 7.7 Water cement ratio
- 7.8 Definition & its effect on strength of concrete
- 7.9 Curing of concrete, controlled concrete and ordinary concrete
- 7.10 Nominal mix proportions
- 7.11 Grades of concrete and their specific uses

8. Timber:

- 8.1 Definition
- 8.2 Characteristics of good quality timber
- 8.3 Names of commonly used quality timber and its specific uses in construction
- 8.4 Defects in timber
- 8.5 Decay and diseases
- 8.6 Seasoning of timber
- 8.7 Objectives & common methods of seasoning - natural & artificial
- 8.8 Preservation of timber by common methods
- 8.9 Timber products & substitutes

9. Metals and Other Engineering Material:

- 9.1 Characteristics and uses of - Cast Iron, Mild Steel, High Tensile Steel (HTS), HYSD & Alloy Steel
- 9.2 Uses of - Expanded metal, IRC Fabric, Cast Aluminum, Brass, Polymer, Plain & Frosted Glass, Tar & Bitumen

10. Paints and Varnishes:

- 10.1 Definition

- 10.2 Objectives and characteristics of good paint
- 10.3 Composition of oil bound paint
- 10.4 Types, characteristics & applications

Group – B
BUILDING CONSTRUCTION

11. Construction Planning and Storage of Materials:

- 11.1 Definition of construction planning
- 11.2 Planning techniques & advantages
- 11.3 Storage of materials at site

12. Foundations:

- 12.1 Concept of foundation
- 12.2 Objectives of foundation
- 12.3 Determination of width and depth of foundation
- 12.4 Different types of foundation used at specific locations (no details of construction)
- 12.5 Causes of failure of foundation

13. Bricks and Stones Masonry:

- 13.1 Brick Masonry
- 13.2 Technical terms use in brick masonry
- 13.3 Bonding
- 13.4 Objectives of bonding
- 13.5 Different type of bonding, their uses at specific locations
- 13.6 General principles and precautions in brick masonry work
- 13.7 Mortar, tools and equipment used in brick masonry work
- 13.8 Reinforced brick work - its advantages, uses of ordinary brick work
- 13.9 Brick parapet - object of providing it – thickness of walls
- 13.10 Stone Masonry: Classification - Rubble & Ashlars
- 13.11 Their characteristics and uses
- 13.12 Mortar with usual proportion
- 13.13 List of tools and equipment

14. Damp Proofing:

- 14.1 Dampness – Causes of dampness & its effects
- 14.2 Prevention of dampness
- 14.3 Materials used for damp proofing
- 14.4 Damp Proof Course used for basement and at plinth

15. Lintels & Arches:

- 15.1** Definition of Lintels
- 15.2** Its advantages and classification
- 15.3** Definition of Arches
- 15.4** Objectives of providing arches
- 15.5** Parts of an arch, classification of arches (schematic sketches), comparison between arches and lintels

16. Roofs & Roof Coverings:

- 16.1** Classification of roofs
- 16.2** Flat roofs and pitched roofs
- 16.3** Different types of merits and demerits of flat and pitched roofs
- 16.4** Roof Coverings - Thatch slabs, Tiles AC sheet & CGI sheet
- 16.5** Their specific uses

17. Doors & Windows:

- 17.1** Door - Different types
- 17.2** Its uses at specific locations
- 17.3** Windows - Different types
- 17.4** Its uses at specific locations

18. Scaffolding:

- 18.1** Objectives of scaffolding
- 18.2** Different types of scaffolding
- 18.3** Its specific uses
- 18.4** Advantages of steel scaffolding over timber scaffolding

19. Stair & Stair Cases:

- 19.1** Definition and objectives of having stairs
- 19.2** Parts of a stair & staircase
- 19.3** Classification of different types of a staircase with illustrative simple line sketches, their uses at specific locations

20. Flooring:

- 20.1** Floor – Objective of a floor
- 20.2** Different types of floors
- 20.3** Its uses at various locations
- 20.4** Composition and construction details of artificial stone flooring
- 20.5** Terrazzo or Mosaic Flooring

21. Wall Finish:

- 21.1** Plastering and Pointing
- 21.2** White and Colour Washing
- 21.3** Distemping & Cement based painting
- 21.4** Objectives, composition and uses at specific locations

Fundamentals of Computer

Class XI

Examination Duration: 2 Hours

S. No.	Name of the Topic	No. of Hours
1	Introduction to Computer	5
2	Number System	8
3	Operating System	4
4	Introduction to MS Office	2
5	Microsoft Word	10
6	Microsoft Excel	16
7	Microsoft Power Point	4
8	Internet & Security	8
9	Project Work	8
TOTAL NUMBER OF HOURS		65

1. Introduction to Computer:

- 1.1 Introduction & application of computers
- 1.2 History of the Computer – Evolution and generation of computers
- 1.3 Hardware & Software
- 1.4 Different Hardware devices with physical demonstration
- 1.5 Different types of software used with their areas of application
- 1.6 Storage devices – Evolution and its application in modern technology
- 1.7 Characteristics of the computer
- 1.8 Organization of the computer
- 1.9 Basic operation carried out by the computer
- 1.10 Understanding the day to day applications of the computer

2. Number System:

- 2.1 Introduction to the number system
- 2.2 Types of number systems used – Decimal, Binary, Octal and Hexadecimal
- 2.3 Conversion from Decimal to Binary and vice-versa
- 2.4 Conversion of Decimal to Octal and vice-versa
- 2.5 Conversion of Decimal to Hexadecimal and vice-versa
- 2.6 Conversion of Fractional Decimal to Binary, Octal and Hexadecimal
- 2.7 Logic Gate – Not, Or, And

3. **Operating System:**

- 3.1 Introduction about Operating System and its uses
- 3.2 Types of Operating System
- 3.3 Application of Operating System in our computer
- 3.4 Method of Installing the Operating System
- 3.5 Method of partitioning the Hard Disk during the installation of the Operating System
- 3.6 Advantages & Comparisons of different types of Operating Systems

4. **Introduction to MS Office:**

- 4.1 Introduction to Microsoft Office Package
- 4.2 Different applications available in the package
- 4.3 Advantages and application of different applications available
- 4.4 An overview on the available applications – MS Word, Excel, PowerPoint, Access, Outlook
- 4.5 Process of Opening the Microsoft Office Package from the START BUTTON

5. **Microsoft Word:**

- 5.1 Introduction
- 5.2 Procedure of opening the Microsoft Word Application
- 5.3 Introduction to the Microsoft Word Screen/Page
- 5.4 Understanding different options available
- 5.5 Understanding different context menus available on the page with their application
- 5.6 Understanding the **OFFICE BUTTON** – New, Open, Save, Save As, Print, Prepare, Publish, Close, Word Options, Recent Documents
- 5.7 Understanding the **HOME** Menu – Clipboard Option, Font Options, Paragraph, Styles
- 5.8 Understanding the **INSERT** Menu – Pages, Tables, different methods of inserting pictures, Links, Header & Footer, Text Formatting, Symbols
- 5.9 Understanding the **PAGE LAYOUT** Menu – Different themes, Page Setup, Page Background, Paragraph Indentation, Alignment
- 5.10 Understanding the complete process of Mail Merge (Letter)
- 5.11 Understanding the Concept of viewing the pages in different styles, New windows, Split page option
- 5.12 Practical work on the above content

6. **Microsoft Excel:**

- 6.1 Introduction
- 6.2 Procedure of opening the Microsoft Excel Application
- 6.3 Introduction to the Microsoft Excel Screen/Page
- 6.4 Understanding different options available
- 6.5 Understanding the method of renaming, adding and removing the sheet
- 6.6 Understanding the method of copying and moving the sheet

- 6.7 Understanding different short cuts used on the application
- 6.8 Understanding the **HOME** menu – Clipboard Options, Font Options, Paragraphs, Styles,
- 6.9 Understanding the **INSERT** Menu – Table Creation, Different methods of inserting pictures & shapes, Charts, Links and Method of formatting the text
- 6.10 Understanding the **PAGE LAYOUT** Menu – Themes, Page setup, Scale, Sheet Options, Alignment
- 6.11 Understanding the **FORMULAS** Menu – Insert function, Function Library (Auto Sum, Logical, Text, Lookup, Date & time)
- 6.12 Conditional Formatting
- 6.13 Basic Menu options like View, Data and Review
- 6.14 Practical work on the above content

7. **Microsoft PowerPoint:**

- 7.1 Introduction
- 7.2 Procedure of opening the Microsoft Power Point Application
- 7.3 Introduction to the Microsoft Power Point Screen/Page
- 7.4 Understanding different options available
- 7.5 Understanding different shortcuts used for the application
- 7.6 Understanding the **HOME** Menu – Clipboard, Slides, Font, Paragraph indentation, drawing tools, find & replace,
- 7.7 Understanding the **INSERT** Menu - Table Creation, different methods of inserting pictures & shapes, charts, link, method of formatting the text & methods of inserting movie clip & audio in the slide
- 7.8 Understanding the **DESIGN** Menu – Page Setup, different themes to be used as the background of the slides, colours, fonts, effects, background styles
- 7.9 Understanding the **ANIMATION** Menu – Custom Animation, different transition options for the slides, background music, transition speed, slideshow option (on mouse click or after time interval that is set)
- 7.10 Understanding the **SLIDE SHOW** Menu – Start & End of the slide show, slide show setup, monitoring the resolution and other factors
- 7.11 Understanding various options like Review and View
- 7.12 A presentation to understand the working of different options available in the application

8. Internet & Security:

- 8.1** Introduction to Internet & Security
- 8.2** Different types of connections that can be established in the system
- 8.3** Uses, advantages and disadvantages of the Internet
- 8.4** Security – Definition & Goals
- 8.5** Basic ISP (Internet Service Providers) Infrastructure
- 8.6** Virus – Definition and its different types
- 8.7** Firewall – Definition and applications
- 8.8** Understanding the basic security measures

9. Project Work

The students will prepare a project work using the concepts taught in the 'Fundamentals of Computer'.

Civil Engineering Drawing
Class XI

Examination Duration: 5 Hours

S. No.	Name of the Topic	No. of Hours
1	Engineering Graphics	117
2	Building Drawings	64
TOTAL NUMBER OF CLASSES		181

Engineering Graphics

S. No.	Name of the Topic	No. of Hours
1	Engineering Drawing: Introduction and its importance	2
2	Drawing Instruments: Its Standards and Uses	4
3	Sheet Layout and Sketching	2
4	Lines, Lettering and Numbering	14
5	Dimensioning	4
6	Drawing of Geometrical Figures	30
7	Method of presentation of Engineering Drawing	6
8	Scale	10
9	Drawing of Solid Figures	12
10	Orthographic Projection	27
11	Free Hand Drawing of Tools & Equipment	6
TOTAL NUMBER OF HOURS		117

1. Engineering Drawing: Introduction and its importance:

- 1.1 Introduction
- 1.2 Definition of Drawing
- 1.3 Classification of Drawing
- 1.4 Viewing of engineering drawing sheets
- 1.5 Method of folding printed drawings

2. Drawing Instruments: Its Standard and Uses:

- 2.1 Drawing Board
- 2.2 Drafters & Set Squares
- 2.3 Drawing instruments box

- 2.4 Scales, Protractor and French curve
- 2.5 Drawing pencils and different grades

3. Sheet Layout and Sketching:

- 3.1 Standard Sheet Layout
- 3.2 Standard Sheet Sizes
- 3.3 Margin Spacing
- 3.4 Border Lines
- 3.5 Designing of standard title block with details

4. Lines, Lettering and Numbering:

- 4.1 **Lines** – Introduction, its type, definition, uses and practical application
- 4.2 **Lettering & Numbering** –
 - a Single Stroke Capital letters (Vertical and Inclined)
 - b Gothic Letters
 - c Numbering using the same style as stated above
 - d Characteristics of different types of lettering

5. Dimensioning:

- 5.1 Dimensioning terms and notation
- 5.2 Types of Arrow heads
- 5.3 Placing of the dimensions – Aligned & Uni-Directional System
- 5.4 Arrangement of Dimensioning
- 5.5 General rules and practical hints for dimensioning
- 5.6 Practical representation of dimensions with examples

6. Drawing of Geometrical Figures:

- 6.1 Bisecting a line
- 6.2 To draw perpendicular lines
- 6.3 To draw parallel lines
- 6.4 To divide a line into equal number of even and odd parts
- 6.5 To bisect and trisect an angle
- 6.6 To form different types of angles – Acute, Obtuse, Reflex
- 6.7 To construct different types of triangle – Scalene, Isosceles, Equilateral and Right Angle
- 6.8 To draw an arc of a given radius, touching a given arc and a given straight line
- 6.9 To draw a continuous curve of circular arcs passing through any number of given points
- 6.10 To construct different types of quadrilaterals
- 6.11 To construct different types of polygons using various methods
- 6.12 To construct different types of polygons using the same base
- 6.13 To draw a circle and understand all its elements
- 6.14 To inscribe different polygons in a circle
- 6.15 To describe different polygons about a circle
- 6.16 To draw a tangent on two same size circles and two different sizes of circles
- 6.17 To determine the length of a given arc
- 6.18 To draw a circle touching two converging lines

7. Method of presentation of Engineering Drawing:

- 7.1 Different methods of representing engineering drawing

- 7.2 Understanding of isometric views with suitable examples
- 7.3 Understanding of oblique view with examples

8. Scale:

- 8.1 Introduction and types of scales
- 8.2 Construction of a Plain Scale
- 8.3 Construction of a Vernier Scale
- 8.4 Construction of a Diagonal Scale

9. Drawing of Solid Figures:

- 9.1 Cube, Cuboids, Pyramid, Prism, Cone & Frustum of a Cone

10. Orthographic Projection:

- 10.1 Introduction & principle of projection
- 10.2 Methods of projection
- 10.3 Plane of projection
- 10.4 Four quadrants
- 10.5 First angle of projection – Introduction and symbols used
- 10.6 Examples related to first angle of projection
- 10.7 Constructing a view in first angle from an isometric view
- 10.8 Third angle of Projection - Introduction and symbols used
- 10.9 Examples related to third angle of projection
- 10.10 Constructing a view in third angle from an isometric view
- 10.11 To construct isometric views from an orthographic projection

11. Free hand drawing of different tools used in the machine shop

BUILDING DRAWING

S. No.	Name of the Topic	No. of Hours
1	Introduction	4
2	Planning of building	60
TOTAL NUMBER OF HOURS		64

- 1. Introduction**

- 2. Planning of building: (Single storied building comprising two rooms, bath, WC, kitchen, front verandah, with provision of a staircase)**
 - 2.1** Principles of planning a residential and public building
 - 2.2** Space requirements and norms for various units of residential and public building
 - 2.3** Drawing of line plans of residential & public buildings
 - 2.4** Development of line plan – ground floor plan and roof plan with provision for drainage layout
 - 2.5** Elevation (front elevation)

Engineering Lab

Class XI

Examination Duration -5 Hours

Sl. No.	Name of the Topic	No. of Hours
1	CONSTRUCTION TECHNOLOGY LAB	130
2	ELECTRICAL INSTALLATION LAB	37
3	PAINTING SHOP	37
4	PLUMBING SHOP	47
TOTAL NUMBER OF HOURS		251

CONSTRUCTION TECHNOLOGY LAB

1. Identification and demonstration of building materials & tools used in the construction of building work
2. Construction of L-junction with model bricks in stretcher & header bonds
3. Construction of L-junction with one brick thick wall in English and Double Flemish bonds
4. Construction of L-junction with one & half brick thick wall in English and Double Flemish bonds
5. Construction of L-junction with two brick thick wall in English and Double Flemish bonds
6. Idea of earth quake resistant load bearing brick masonry and R.C.C. framed structures
7. Idea of laying out of building plans
8. Demonstration of various mortars, cement concrete mixes
9. Idea of mixing, transportation, placement, compaction and curing of cement concrete and their various methods
10. Idea of form work, centering & shuttering and their removal periods for various structural members of R.C.C.
11. Demonstration of various water supply fixtures and sanitary fittings
12. Site visits

ELECTRICAL INSTALLATION LAB

1. To control one lamp with one switch
2. To control two lamps in series, two lamps in parallel and one alone
3. Study of stair case lighting system, using a two-way switch
4. Study of Intermediate switch and its application in corridor lighting systems
5. To make connections for gallery lighting
6. To make connection for 230V bell
7. To make connection for 6V bell using 230/6V transformer
8. To make connection for bell with indicator

9. Study of various types of wires and cables used in domestic wiring
10. Measurement of SWG of the wires
11. Practice in making 'T' and Mesh joint
12. Practice in making plastic casing-capping wiring for one point
13. Practice in making P.V.C. conduit wiring for one point
14. Testing of following faults of electrical installation
15. Open circuit fault
16. Short circuit fault
17. Earth leakage test
18. To make connection for a fluorescent tube light and to study the function of choke and starter
19. To make connection of an energy meter
20. To measure energy consumed by a 200W/500W load in given time
21. To measure error in the meter
22. Verification of Ohm's law and plotting of V-I curve
23. Study of various types of multimeters
24. Measurement of resistance with the help of analog and digital multimeters
25. To measure the resistance of heating element of the kettle
26. To determine the efficiency of electric kettle
27. Study of a Domestic Distribution Bond

PAINTING SHOP

1. Preparation of surface
2. Application of primer coat
3. Polishing on wood items
4. Painting wooden items
5. Painting steel items
6. Painting of jobs by brush, roller and spray

PLUMBING SHOP

1. Introduction to pipes and pipe fittings, their specifications
2. Demonstration, function and use of plumber's tools and equipments
3. Practice on external and internal threading
4. Demonstration of various joints by the instructor
5. Preparation of right angled pipe joints

Workshop Practice
Class XI

Sl. No.	Name of the Topic	No. of Hours
1	Carpentry Shop	3
2	Welding Shop	3
3	Fitting shape	3
4	Plumbing shop	3
5	Sheet Metal Shop	3
6	List of Laboratory Experiments	138
TOTAL NUMBER OF HOURS		153

1. Carpentry Shop:

- 1.1 Introduction
- 1.2 Various types of wood
- 1.3 Different types of tools, machines and accessories

2. Welding Shop:

- 2.1 Introduction
- 2.2 Types of welding, ARC welding & Gas welding cutting
- 2.3 Welding of dissimilar materials, section of welding rod materials, size of welding rod and work piece
- 2.4 Different type of flame
- 2.5 Elementary symbol representation
- 2.6 Safety precaution in welding safety equipment and its use in welding processes

3. Fitting Shape:

- 3.1 Introduction
- 3.2 Various marking, measuring, cutting, holding and staking tools
- 3.3 Different fitting operations like chipping, fitting, right angle, marking, drilling, tapping, etc.
- 3.4 Working principle of drilling machine, tapping dies and its use
- 3.5 Safety precautions and safety equipment

4. Plumbing Shop:

- 4.1 Introduction
- 4.2 Various marking, measuring, cutting, holding and staking tools
- 4.3 Different G.I pipes, PVC pipes, flexible pipes used in practice
- 4.4 G.I pipes and PVC pipes, fitting and accessories

5. Sheet Metal Shop:

- 5.1.** Introduction
- 5.2.** Various types of tools, equipment and accessories
- 5.3.** Different types of operations in sheet metal shop
- 5.4.** Soldering and Riveting

6. List Of Laboratory Experiments:

6.1. Wood Working Shop:

- 6.1.1.** Demonstration of different wood working tools / machines
- 6.1.2.** Demonstrations of different wood working processes, like planing marking, chiseling, grooving, turning of wood, etc.
- 6.1.3.** One simple job involving any one joint like mortise and tenon, dovetails, bridle, half lap, etc.

6.2. Welding Shop:

- 6.2.1.** Demonstration of different welding tool / machines
- 6.2.2.** Demonstration on arc welding, gas welding, gas cutting and rebuilding of broken parts with welding
- 6.2.3.** One simple job involving butt and lap joint

6.3. Fitting Shop:

- 6.3.1.** Demonstration of different fitting tools and drilling machine and power tools
- 6.3.2.** Demonstration of different operations like chipping, filing, drilling, tapping, cutting, etc.
- 6.3.3.** One simple fitting job involving practices of chipping, filing, drilling, tapping, cutting, etc.

6.4. Plumbing Shop:

- 6.4.1.** Demonstration of different plumbing tools
- 6.4.2.** Demonstration of different operations in plumbing, observing different pipes joints and pipes accessories, different samples of PVC pipes and PVC pipes fittings simple pipe joint with nipple, coupling for standard pipe.

6.5. Sheet Metal Shop:

- 6.5.1.** Various types of tools, equipment and accessories.
- 6.5.2.** Different types of operations in sheet metal shop
- 6.5.3.** Soldering and riveting one simple job, involving sheet metal operation.

CIVIL ENGINEERING

TECHNICIAN

SYLLABUS FOR CLASS XII

English
Class XII

Examination Duration: 3 Hours

S. No.	Name of the Topic	No. of Hours
	GRAMMAR	
1	Direct & Indirect Speech	18
2	Phrases & Idioms	8
3	Letter Writing (Informal)	11
4	Report Writing, Essay Writing & Precise Writing	15
5	Comprehension & Story Writing	13
	LITERATURE	
1	Wright Brothers	8
2	Jamshedji Tata	8
3	Solar Energy	8
4	Thomas Edison	8
5	Henry Ford	8
TOTAL NUMBER OF HOURS		105

General Foundation, Industrial Sociology and Entrepreneurship
Class XII

Examination Duration: 3 Hours

S. No.	Name of the Topic	No. of Hours
1	The Constitution of India	5
2	An Ideal Supervisor	5
3	Industrial Safety, First Aid and Hygiene	10
4	Entrepreneurship	10
5	Labour Laws	16
6	Environmental Science	10
7	Estimation & Costing	12
8	Project Plan	12
TOTAL NUMBER OF HOURS		80

1.
The

Constitution of India:

- 1.1. Salient Features
- 1.2. Preamble to the Constitution
- 1.3. Fundamental Duties
- 1.4. Directive Principles of State Policy
- 1.5. Difference between Fundamental Rights and Directive Principles

1. An Ideal Supervisor:

- 2.1 Qualities of an ideal supervisor

2. Industrial Safety, First Aid and Hygiene:

- 3.1. Concept of Safety
- 3.2. Safety Consciousness
- 3.3. Necessity of safety
- 3.4. Safety Measures

3. Entrepreneurship:

- 4.1. Introduction
- 4.2. Definition of Entrepreneurship
- 4.3. Need for Self-Employment
- 4.4. Advantages of Entrepreneurship
- 4.5. Roles and responsibilities of an Entrepreneur

4.6. Qualities of a good Entrepreneur

5. Labour Laws:

- 5.1. Factories Act 1948
- 5.2. Apprentices Act
- 5.3. Employees State Insurance (ESI) Act
- 5.4. Payment of Wage Act 1936
- 5.5. Minimum Wages Act & Rules
- 5.6. Employees Provident Fund Act (EPF)
- 5.7. Workmen's Compensation Act

6. Environmental Science:

- 6.1 Effect of pollution on Human Health
- 6.2 Impact of technology on Environment
- 6.3 Impact of pollution on Environment
- 6.4 Waste Management

7. Estimation & Costing:

- 7.1 Introduction to Estimation and Costing
- 7.2 Importance and Aims of Estimation & Costing
- 7.3 Functions of Estimating Department
- 7.4 Qualities of an Estimator
- 7.5 Estimating Procedures and Errors in Estimation
- 7.6 Constituents of Estimation
- 7.7 Advantages of Standard Costing
- 7.8 Differences between Estimation and Costing
- 7.9 Procedures of Costing & Costing methods
- 7.10 Cost Control and Advantages of Efficient Costing
- 7.11 Elements of Cost
- 7.12 Components of Cost and the process of calculating material cost & labour cost
- 7.13 Block diagram of components of cost
- 7.14 Methods of calculating indirect expenses and depreciation cost
- 7.15 Repairs and Maintenance Costing
- 7.16 Basic numerical on Estimation and Costing

8. Project Plan:

- 8.1 Introduction
- 8.2 Definitions of Working Capital, Fixed Capital, Budget
- 8.3 Market Survey
- 8.4 Project Planning
- 8.5 Project Capacity
- 8.6 Selection of Site and Plant Layout

- 8.7** Product design and development
- 8.8** Factors considered while designing a product
- 8.9** Product drawings and design specification
- 8.10** Product Development
- 8.11** Material Requirement
- 8.12** Operation Planning
- 8.13** Equipment Requirement
- 8.14** Material Handling
- 8.15** Break-Even Point
- 8.16** Preparation of project

Costing, Contract and Valuation

Class XII

Examination Duration: 3 Hours

Sl. No.	Name of the Topic	No. of hours
1	Estimation & Costing	48
2	Contracts & Accounts	97
3	Construction Management	52
TOTAL NUMBER OF HOURS		197

ESTIMATING & COSTING

S. No.	Name of the Topic	No. of Hours
1	Overview of Estimating and Costing	8
2	Building Estimate	30
3	Estimate of Other Structures	10
TOTAL NUMBER OF HOURS		48

1. Overview of Estimating and Costing:

- 1.1 Meaning of the terms Estimating and Costing
- 1.2 Purpose of Estimating and Costing
- 1.3 Factors that affect estimation
- 1.4 Types of Estimate – Approximate & Detailed
- 1.5 Explanation of relevant technical terms - contingencies, work charge establishment overhead, tools and plants, schedule of rates and quantities, specification, administrative approval, technical sanction plinth area, contact area, floor area, floor area ratio mode of measurement, schedule of rate and site plan

2. Building Estimate:

- 2.1 Single storied building shall comprise two rooms, bath, WC, kitchen in front of verandah
- 2.2 Long wall & Short wall method
- 2.3 Centre line Method
- 2.4 Items of work – Earth work in excavation for foundation
- 2.5 Brick Flat Soling (Under Foundation & Floor)

- 2.6 Foundation concrete& Brick work in substructure
- 2.7 Earth work in filling & DPC
- 2.8 Plinth filling by silver sand brick work in super structure
- 2.9 Form work & RCC excluding reinforcement
- 2.10 Reinforcement (By percentage of component structure)
- 2.11 Lime terracing or other similar roofing treatment
- 2.12 Similar finishing items –Plastering, pointing, pointing wall, doors & window
- 2.13 IPS and terrazzo floor
- 2.14 **Preparation of bar bending schedule:**
 - a. Lintel
 - b. Chajja
 - c. Column
 - d. Slab (One way and Two way)
 - e. Beams and their estimate

3. Estimate of Other Structures:

- 3.1 Estimate of a tube well
- 3.2 Estimate of a septic tank with soak pit

CONTRACTS & ACCOUNTS

S. No.	Name of the Topic	No of Hours
1	Introduction	2
2	Contract	10
3	Tender and tender documents	18
4	Accounts in PWD	15
5	Payment to contractor	15
6	Specifications	12
7	Valuation	15
8	Arbitration	10
TOTAL NO OF HOURS		97

1. Introduction:

1.1 Procedure of execution of work by PWD:

- 1.1.1 Organization of PWD & functions of their personnel
- 1.1.2 PWD procedure of initiating the work, administrative approval, technical sanction, budget provision
- 1.1.3 Method used in PWD for carrying out works, contract method and departmental method, rate list method, piece work method, days' work method, departmental method (Nominal muster roll & Casual muster roll)

2. Contract:

- 2.1** Definition of contract, objectives of contract & requirements of valid contract
- 2.2** Types of engineering contract –lump sum contract, item rate contract, percentage rate contract & labour contract
- 2.3** Class of contractor & registration of contractor

3. Tender and tender documents:

- 3.1** Definition of tender, necessity of tender& types (Local and Global)
- 3.2** Tender notice, points to be included while drafting tender notices & drafting of tender notices
- 3.3** Meaning of terms -Earnest money, Security deposit, Validity period, right to reject one or all, tender corrigendum to tender notice and its necessity
- 3.4** Tender documents- List, Schedule A, Schedule B & Schedule C
- 3.5** Terms related to tender documents- Contract conditions, time limit, time extension, penalty, defective material and workmanship, termination of contract, suspension of work, subletting of contract, extra items, escalation & arbitration defect liability periods
- 3.6** Filling the tender by a contractor and points to be observed for the same
- 3.7** Procedure of submitting filled in tender documents, procedure of opening a tender, comparative statement, scrutiny of tenders, awarding a contract, acceptance letter, work order & unbalanced tender

4. Accounts in PWD:

- 4.1** Various account forms and their uses, measurement books & nominal muster roll

5. Payment to Contractor:

- 5.1** Mode of payment to the contractor, Interim payment and its necessity, advance payment, secured advance, on account payment, final payment, first and final payment, retention money, reduced rate payment, petty advance & mobilization advance

6. Specifications:

- 6.1** Necessity and importance of specifications of an item, points to be observed in framing specifications of an item & types of specification- brief and detailed
- 6.2** Preparing detailed specifications of items in civil engineering work & standard specification book

7. Valuation:

- 7.1 Definition, necessity of valuation - cost price and value, differences between the terms
- 7.2 Types of Value - Book value, Scrap value, Salvage value, Market value and factors affecting value
- 7.3 Depreciation, Obsolescence, sinking fund, methods of calculation of depreciation using straight line method, sinking fund method, constant percentage method and quantity survey method

8. Arbitration:

- 8.1 Introduction
- 8.2 Procedure of Arbitration

CONSTRUCTION MANAGEMENT

Sl. No.	Name of the Topic	No. of Hours
1	Information and Support system	15
2	Business Finance Account	25
3	Population Education	12
TOTAL NUMBER OF HOURS		52

1. Information & support systems:

- 1.1 Small scale business planning, requirements.
- 1.2 Govt. & institutional agencies, formalities.
- 1.3 Statutory requirements and agencies.

2. Business Finance & Accounts:

- 2.1 Cost of project.
- 2.2 Sources of finance.
- 2.3 Assessment of working capital.
- 2.4 Product costing.
- 2.5 Profitability.
- 2.6 Break even analysis.
- 2.7 Finance rating & significance.

3. Population Education:

- 3.1 Family planning

- 3.2** Small family norms
- 3.3** Gender Equality
- 3.4** Female Infanticides
- 3.5** Abortion laws/Euthanasia

Surveying
Class XII

Examination Duration: 3 Hours

S. No.	Name of the Topic	No. of Hours
1	Types of Survey	6
2	Measurement of Horizontal Distance	18
3	Compass Survey	22
4	Levelling	32
5	Contouring	14
6	Area Measurement	12
7	Plane Table Surveying	12
8	Introduction to theodolite	18
9	Total Station	18
TOTAL NO OF HOURS		152

1. Types of surveying:

- 1.1** Definition
- 1.2** Objectives of surveying
- 1.3** Principles of surveying
- 1.4** Classification of surveying primary – plain & geodetic
- 1.5** Secondary - on basis of the instrument method, objectives and nature of field

2. Measurement of horizontal distance:

2.1 Methods of measuring horizontal distance:

2.1.1 Measurement by chain:

- a) On level ground and sloping ground
- b) Reduction to measurement in slope
- c) Ranging direct and indirect ranging

2.1.2 Obstacles in chaining:

- a) Obstacles to ranging but not chaining
- b) Obstacles to chaining but not ranging
- c) Numerical problems

2.1.3 Chain and cross staff survey:

- a) For finding area of a field (Numerical problems)

2.1.4. Field work for chain survey-

- a) Collection of data in field book from field work
- b) Conventional signs related to survey
- c) Degree of accuracy of chaining

3. Compass survey:

- 3.1 Brief introduction to different types of horizontal angles and directions
- 3.2 Principle of compass survey
- 3.3 Bearing of lines
- 3.4 True meridian
- 3.5 Magnetic and arbitrary bearing
- 3.6 Fore bearing, Back bearing, Whole circle bearing, Quadrantal and reduced bearing
- 3.7 **Prismatic compass and trough compass component construction and use:**
 - a) Local attraction
 - b) Causes, precautions to be taken to avoid local attraction
 - c) Correction of bearing affected due to local attraction
 - d) Calculation of included angles
- 3.8 **Traversing-**
 - a) Open traverse
 - b) Closed traverse
 - c) Check on open and closed traverse
 - d) Graphical adjustment for closing
- 3.9 Calculation of bearing angles and local attraction
- 3.10 **Error in compass surveying:**
 - a) Instrumental error
 - b) Personal error
 - c) Natural error
 - d) Permissible value of error

4. Levelling:

- 4.1 Definition - level surface
- 4.2 Level line, horizontal line & vertical line
- 4.3 Datum surface, mean sea level, reduced level, bench mark and its types
- 4.4 Study and use of engineering level (A) during level – Components & Construction
- 4.5 **Terms used in levelling:**
 - a) Line of sight
 - b) Line of collimation
 - c) Bubble tube axis
 - d) Leveling
 - e) Staff folding type
 - f) Fore sight
 - g) Back sight

- h) Intermediate sight
- i) Change point
- j) Height of collimation
- k) Recording in level book
- l) Temporary adjustment of dumpy level
- m) Procedure for permanent adjustment

4.6 Reduced level:

- a) Method of calculation by rise and fall method
- b) HI method
- c) Arithmetical checks
- d) Numerical problems - computation of missing readings

5. Contouring:

- 5.1 Characteristics of contours
- 5.2 Method of locating contours
- 5.3 Indirect method of contouring (Interpolation of contours)
- 5.4 Direct contouring method, established grade contours
- 5.5 Uses of contour
- 5.6 Interpretation and typical contour sheets
- 5.7 Area measurement - introduction

6. Plane Table Surveying:

- 6.1 Introduction
- 6.2 Principle of plane table surveying
- 6.3 Equipment and accessories in plane table surveying
- 6.4 Its uses
- 6.5 Working with plane tables
- 6.6 Fixing, levelling, centering, orientation, – by trough compass
- 6.7 **Different methods of plane tabling work:**
 - a. Radiation
 - b. Intersection
 - c. Traverse
 - d. Resection
- 6.8 Advantage and disadvantage of plane table survey
- 6.9 Errors in plane table survey, instrumental, in plotting and due to manipulation and sighting

7. Theodolites:

- 7.1 Introduction on Theodolite
- 7.2 Accessories required
- 7.3 Uses of the instrument
- 7.4 Procedure of collecting data from the field
- 7.5 Numerical problems
- 7.6 Plotting on sheet

8. Total Stations:

8.1 Introduction on Total Station

8.2 Use in practical field

Construction Technology
Class XII

Examination Duration: 3 Hours

S. No.	Name of the Topic	No. of Hours
1	Concrete technology	34
2	Strength of materials & theory of structure	36
3	Fundamentals of Designs of RCC Structure	28
4	Fundamentals of Designs of Steel Structure	21
5	Geotechnical Engineering	23
TOTAL NUMBER OF HOURS		142

CONCRETE TECHNOLOGY

S. No.	Name of the Topic	No. of Hours
1	Introduction	5
2	Materials for Cement Concrete	12
3	Preparation of concrete	17
TOTAL NUMBER OF HOURS		34

1. Introduction:

1.1. General, Definition of concrete, utility of the subject & job opportunity

2. Materials for Cement Concrete:

2.1. Cement - Manufacture and chemical composition, Different types of cement, its physical and chemical properties & uses, Test as per BIS for fineness, Normal consistency of standard cement paste, Initial and final setting time, Soundness test and Compressive strength test

2.2. Aggregate - Classification, Specification for fine and coarse aggregates, Standard tests as per BIS Sieve analysis of coarse aggregate and fine aggregate, Water absorption, Moisture content of

coarse and fine aggregate, Grading of aggregate, Size of aggregate used for different purposes, Proportion of aggregate, Deleterious materials, Aggregate and its effects

2.3. Water -Quality of water, Chemical properties, Function & Sources

2.4. Use of chemicals and admixtures with properties and use as recommended in relevant BIS: code of practice

3. Preparation of concrete:

3.1 Introduction – Object of concrete preparation

3.2 Stages involved in preparation of concrete – Batching, Mixing, Transporting, Placing, Compacting, Finishing, Description of each method with object and machinery used

3.3 Proportion and designation of concrete –Nominal mix, Design mix & Grade of Concrete

3.4 Workability and its measurements standard test, Segregation and bleed of concrete, factors influencing workability, Different methods of curing, Concrete and Form work

3.5 Water/Cement ratio

3.6 Abraham law, Effective strength, Durability, Workability & impermeability of concrete

3.7 Properties of wet and hardened concrete

3.8 Ordinary concrete and controlled concrete, Preliminary test and work test

3.9 Machinery used for concreting work - Plant for handling cement and aggregate, Machinery for mixing and transporting concrete mixture, types of machinery for compaction

3.10 Tests on hardened concrete, Non-destruction test on concrete, general usefulness of NDT, Rebound method, Ultrasonic pulse velocity method and Pill out test

STRENGTH OF MATERIALS & THEORY OF STRUCTURE

S. No.	Name of the Topic	No. of Hours
1	Bending Moment of SF in Beam	36
TOTAL NUMBER OF HOURS		36

1. Bending Moment of SF in Beam:

1.1 Beams & its classification

1.2 Difference types of loading on a beam

1.3 Shearing Force at any section of a beam

1.4 Bending moment of any section of a beam

1.5 Sign convention for SF and BM

1.6 SF & BM Diagrams for cantilever simply supported beam with different types of loadings

1.7 S F & BM diagrams for beams with intermediate couple having hinged support at one end and free support at the other end

FUNDAMENTALS OF DESIGNS OF RCC STRUCTURE

S. No.	Name of the Topic	No. of Hours
1	Introduction	2
2	Loads and Forces	9
3	Safety and Serviceability	5
4	Design of Rectangular Beam	12
TOTAL NUMBER OF HOURS		28

1. Introduction:

- 1.1 Aim of design
- 1.2 Methods of design – Working stress method, Ultimate load method and Limit state method
- 1.3 Durability, Workmanship & Materials

2. Loads & Forces:

- 2.1 General concept of loads on structure
- 2.2 Dead load
- 2.3 Imposed loads, wind load & snow loads
- 2.4 Earth makes forces
- 2.5 Design load

3. Safety & Serviceability:

- 3.1 General
- 3.2 Limit state of collapse
- 3.3 Limit states of serviceability

4. Design of Rectangular Beam:

- 4.1 Introduction
- 4.2 Behaviour of a beam under load
- 4.3 Assumptions
- 4.4 Analysis and design of singly reinforced rectangular sections balanced section, under reinforced section, over reinforced section – solution of numerical problems
- 4.5 Doubly reinforced rectangular section – solution of numerical problems

FUNDAMENTALS OF DESIGN OF STEEL STRUCTURES

S. No.	Name of the Topic	No. of Hours
1	Introduction	5
2	Riveted Connection	6
3	Welded Connection	6
4	Advantages & Disadvantages	4
TOTAL NUMBER OF HOURS		21

1. Introduction:

- 1.1 Details of structure steel section with their properties, use of built up section from the given tables

2. Riveted connection:

- 2.1 Rivet – Introduction
- 2.2 Different types of riveted joints & failures of riveted joints

3. Welded Connection:

- 3.1 Types of weld & fillet weld – throat thickness, size of weld & length of weld

4. Advantages & Disadvantages:

- 4.1 Riveted connections and welded connections

GEOTECHNICAL ENGINEERING

S. No.	Name of the Topic	No. of Hours
1	Introduction	2
2	Classification of soils	6
3	Index properties of soil	9
4	Consistency of soil	2
5	Permeability of soil	4
TOTAL NUMBER OF HOURS		23

1. Introduction:

- 1.1 Definition soil, Soil mechanics, Origin and Formation of soils and Soil category
- 1.2 Principle mechanics applied to soils & importance of soil mechanics
- 1.3 Application & properties of soils

2. Classification of Soils:

- 2.1** Engineering classification of soil parts, Size classification & textural classify chart
- 2.2** Measurement of particle size distribution using sieve analysis pipette method

3. Index properties of Soils:

- 3.1** Phase diagram for dry, moist and saturated soil
- 3.2** Definition – void ratio, porosity, water content, degree of saturation, unit weight, specific gravity, density, bulk density, dry density, sub-merge density & air content percentage of air voids

4. Consistency of Soil:

- 4.1** Moisture content of volume relationship
- 4.2** Definition of alter Borg limit, Plasticity index, Liquidity index & Shrinkage ratio flow
- 4.3** Index toughness index

5. Permeability of Soil:

- 5.1** Definition of permeability, Darcy's law co-efficient of permeability & factors affecting permeability
- 5.2** Determination of co-efficient of permeability by constant head & variable head permeability

Civil Engineering Drawing
Class XII

Examination Duration: 5 hours

S. No.	Name of the Topic	No. of Hours
1	Building Drawings	109
2	Auto CAD	109
TOTAL NUMBER OF HOURS		218

Building Drawings

S. No.	Name of the Topic	No. of Hours
1	Introduction	12
2	Planning of Building & Bye Laws	85
3	Layout	32
TOTAL NUMBER OF HOURS		129

1. Introduction:

- 1.1 Two storied building

2. Planning of building & Bye Laws:

- 2.1 Principles of planning of residential and public building
- 2.2 Space requirements and norms for various units of residential and public building rules and byelaws of local governing authorities for construction
- 2.3 Drawing of line plans of residential and public building
- 2.4 Development of line plan – Ground floor plan and Roof plan with provision for drainage layout
- 2.5 Elevation (Front elevation)
- 2.6 Two sectional elevations (Section must pass through stair case, bath, WC, kitchen and front verandah)
- 2.7 Site plan (To be developed from a mouza map for conception of location plan)
- 2.8 Foundation details (Trench plan, Section of main well / isolated footing with tie beam (if provided))

3. Layouts:

- 3.1 Layout of building, septic tank, kitchen, toilet & electrical layout

Auto CAD

S. No.	Name of the Topic	No. of Hours
1	Basic tools and figures	55
2	2D Designing	44
3	3D Designing	30
TOTAL NUMBER OF HOURS		129

1. Basic Tools and figures:

- 1.1. Introduction to Auto CAD Software, its uses and application with some practical examples/demo models
- 1.2. Benefits and limitation of Auto CAD
- 1.3. Understanding of the CAD Screen environment– different settings, Workspaces, Menus
- 1.4. Understanding of the different drawing tools used for Auto CAD drawings

2. 2D Designing:

- 2.1 Understanding the basic concept of 2D drafting/drawing
- 2.2 Application of Draw menu – Lines, multi-line, circle, rectangle, ellipse, polygons
- 2.3 Method of using different tools available in the MODIFY Menu – Erase, Trim, Hatch, Join, Explode, Scale, Expand, Mirror, Copy, Offset, Array (Rectangular, Polar)
- 2.4 Drawing of different types of 2D drawing that involves the uses of all the tools available in the Auto CAD Draw & Modify Menu
- 2.5 Understanding the method of providing different dimensions on the drawing – Linear, Aligned, angular, radial, diameter, multi leader
- 2.6 Adding text – single text and multiple texts
- 2.7 Concept of layer creation
- 2.8 Method of printing the drawing using the viewport options and other page setup options available

3. 3D Designing:

- 3.1 Introduction to 3D modelling
- 3.2 Understanding the workspace environment for 3D modelling
- 3.3 Understanding the concept of WCS (World Co-ordinate System) & UCS (User Co-ordinate System)
- 3.4 Method of selecting different coordinates for constructing different profiles
- 3.5 Selection of X, Y, Z coordinates as per the drawing area of the profile
- 3.6 Understanding the tools used for drawing different 3D models – Extrude, Subtract, Revolve, Loft, Press pull, Union, Intersection
- 3.7 Method of using the Sweep command
- 3.8 Construction of single and multi-storied plan with rooms, kitchen, hall, bath, staircase

Civil Engineering Lab
Class XII

Examination Duration: 5 Hrs.

S. No.	Name of the Topic	No. of Hours
1	Civil Engineering Experiments	150
2	Survey Practice	152
3	Civil Engineering Project	70
TOTAL NUMBER OF HOURS		372

1. Civil Engineering Experiments:

(Group 1)

- 1.1. Physical test of bricks
- 1.2. Determination of physical properties of bricks – Size, Shape, Weight, Colour, Water absorption, Efflorescence and Crushing Strength test

(Group 2)

- 1.3 Sieve analysis for coarse and fine aggregate

(Group 3)

- 1.4 Physical tests on ordinary port land cement:
 - a. Determination of fineness of cement by sieving
 - b. Determination of standard consistency of OPC
 - c. Determination of initial and final setting times of OPC
 - d. Determination of soundness of OPC

- 1.5 Coarse aggregate:

- a. Determination of aggregate impact value
- b. Determination of aggregate crushing value

(Group 4)

- 1.6. Physical tests on concrete:
 - a. Determination of workability of concrete
 - b. Slump Test
 - c. Compaction factor test
 - d. Compressive strength concrete cube mould

2. Survey Practice:

2.1 Chain Survey:

- a. Folding & unfolding of chains
- b. Ranging of Lines
- c. Offsetting
- d. Offsetting with 90 turns
- e. Offsetting with tie line turn
- f. Traversing with Chain

2.2 Compass Survey:

- a. Measurements of bearing
- b. Measurements of included angles from bearings
- c. Traversing with Compass
- d. Graphical Adjustments

2.3 Plain Table Survey:

- a. Radiation Method
- b. Intersection Method
- c. Traversing
- d. Two - Point problems
- e. Three - Point problems

2.4 Levelling:

- a. Rise & Fall method
- b. Height of Instrument method
- c. Profile Leveling
- d. Cross Sectioning

2.5 Theodolite:

- a. Introduction to theodolite, its application, measuring angle and distance
- b. To determine the height of the given object by Tangential Method
- c. To measure the height of the given object (Same as in Experiment No 1) using Total Station and comparing the results
- d. To determine the gradient of AB line by Stadia Method
- e. To determine the gradient of AB line by Tangential Method
- f. To determine the gradient of AB line (same as in Experiment No 3 & 4) using Total Station and comparing the results
- g. To plot the area of the given irregular closed traverse by Latitude & Departure Method using theodolite and calculate the area of the traverse
- h. To measure the area of the given traverse (same as in Experiment No 6) using Total Station and comparing results to determine the omitted portion of a base line
- i. To layout a simple circular curve of radius 50 m & length of long chord as 40 m by the method of perpendicular offsets from long chord by taking ordinate interval as 2 m
- j. To plot the given area / building / road, by measuring the co-ordinates of the key points

2.6 Total Station:

- a. To plot Contour Lines
- b. To calculate the volume of earth work / materials for road

3. Civil Engineering Project:

The project report shall be in the following format:

- a. Topic and Objectives
- b. Collection of data & required survey work
- c. Management and construction procedure
- d. Required drawing set
- e. Utility to society (if any)
- f. Conclusion

PLANNING FOR RESIDENTIAL APARTMENT

NOTE: SINGLE STORIED BUILDING SHALL COMPRISE OF TWO ROOMS, BATH, WC, KITCHEN, FRONT VERANDAH WITH A PROVISION OF STAIR CASE

(Around 100sqm covered area)

Architecture planning, preparation of drawing sheet – a topical floor plan, roof plan with provision of drainage, sectional elevation including staircase, trench plan, front view, with landing and estimate of different items of the building

Arrange the building in a 300 sqm of vacant land adjacent to the 12m wide road including placing of essential service unit like tube-well, internal bituminous road area WBM, surface drain network and the boundary wall with the main gate.

LIST OF EQUIPMENTS

CIVIL DRAWING CLASS

SL.NO	ITEMS	SIZE	NOS
1	Draughtsman table	60 X 85 cm	25 nos
2	Draughtsman seating stool	Nil	25nos
3	Instructor's table	1.2m X 0.8m	1 no
4	Instructor's chair	Nil	1 nos
5	Steel almirah for storing materials	Big	1 nos
6	Geometrical models (wooden)		
a	Cube	6 cm	1 no
b	Rectangular block	10 X 15 X 20 cm	1 no
c	Sphere	6 cm dia	1 no
d	Square pyramid 6cm sq. base	6 cm height	1 no
e	Cylinder 6cm dia	10 cm height	1 no
f	Hexagonal prism	10 cm height	1 no
7	Printing frame complete with glass in the front and stand	60cm X 45cm	1 no
8	Ammonia box 100 cm long	20 X 20 X 20cm	1 no
9	Engine divided wooden/plastic scale having graduations 1:1,1:2,1:2.5& 1.5, 1:10 & 1:20,1:50 & 1:100		1 no
10	Diagonal scale	15cm long	1 no
11	8 digit electronic calculator		1 no
12	Drawing pencils	F, HB. B	1 no each
13	Good quality soft eraser		1 no
14	Erasing shield		1 no

LIST OF EQUIPMENTS

DRAWING INSTRUMENTS

Each student should have the under noted items of drawings instruments for one's use.

SL.NO	ITEMS	SIZE	NOS
1	Tee square	12.5cm long	1 no
2	Set square beveled edge 45 degree	20cm long	1 no
3	Protractor-semi circular beveled edge	10 cm	1 no
4	Template for architect		1 set
5	Drawing compass & divider	12cm long	1 no each
6	Optical square of brass body		6 nos
7	Prismatic compass 12 cm dia. complete with tripod		6 nos
8	Dumpy level complete with stand (having range upto 200m)		4 nos
9	Telescope leveling staff 4 m long marked in (cm & m)		4 nos
10	Plane table with tripod stand	60cm X 85cm	6 nos
11	Plane table accessories Hanger Alidade Hand level Plum bob made of brass		1no 6nos 6 nos 6nos 6nos
12	Ordinary transit theodilite complete with tripod (having Vernier)		3 nos
13	Simple planimeter		1 no

LIST OF EQUIPMENTS

CONSTRUCTION TECHNOLOGY

SL.NO	ITEMS	SIZE	NOS
1	Mason'trowel	20cm X 10cm	6 nos
2	Pointing trowel	8cm X 4cm	6 nos
3	English trowel	20cm X 10cm	2 nos
4	Wooden float	20cm X 15cm	6 nos
5	Mason hammer & chisels		6 nos
6	Mason's tri square	30cm X 45cm	6 nos
7	Hand tools a. Spade b. Pickaxe c. Shovel		4 nos 2 nos 3 nos
8	Mason's iron pan	50cm dia.	6 nos
9	Steel float	20cm X 15cm	3 nos
10	Crow bar	3cm dia X 1.2m	6 nos
11	Galvanized iron buckets		4 nos
12	Wire brush standard size		4 nos
13	Wooden measuring box 0.0034cu.mt (1.2 c.ft)		4 nos
14	Weighing machine		1 nos
15	Sledge hammer (5 kg)		1 nos
16	Vicat machine (cement testing)		1 nos
17	Cast iron mould	15cm X 15cm X 15cm	6 nos
18	Slump cone – for determining moisture content in concrete	Bottom dia – 20cm top dia 10cm height 30cm	2 nos
19	A set of I.S. Sieve for analyzing size of large aggregate		1 set
20	A set of IS sieves for mesh for testing fineness of cement		1 no
21	IS sieve for analyzing particle size of sand		1 no
22	10cm angular for collection of soil sample		1 no

LIST OF EQUIPMENTS

CARPENTER'S TOOLS

SL.NO	ITEMS	SIZE	NOS
1	Hand saw 45cm long		6 no
2	Gimlet		6 nos
3	Carpenter's square		3 nos
4	Mortise chisel (batali)	12mm, 20mm & 25mm	2 of each
5	Bench vice for wood work		4 nos
6	Jack planner	30 cm long 20cm long	3 nos 3 nos
7	Rebate planner		2 nos
8	Carpenter's hammer		4 nos
9	Carpenter's hand drill bits 3mm, 5mm.		3 sets
10	Augur	12mm 10mm	1 no each
11	Screw driver	45cm long	2 nos
12	Glass cutting pen		1 nos

LIST OF EQUIPMENTS-

PLUMBING

SL.NO	ITEMS	SIZE	NOS
1	Hand hack saw	30cm	3 nos
2	Flat file	20cm	2 nos
3	Round file	12mm dia.	1 nos
4	Adjustable pipe wrench for pipes	50mm N.B.	3 nos
5	Pipe threading die frame	15mm N.B.	1 set
		25mm N.B.	1 set
		30mm N.B.	1 set
		40mm N.B.	1 set
6	Plumber's bench vice heavy duty		4 nos
7	Pipe vice with portable stand		1 nos
8	Chisel & hammer 12cm chisel for cutting steel		2 nos
9	Hammer 2.5 kg		2 nos
10	Pliers 20cm adjustable type		2 nos