SRM VALLIAMMAI ENGINEERING COLLEGE

An Autonomous Institution

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF CIVIL ENGINEERING

QUESTION BANK

II SEMESTER

ST3262 – INDUSTRIAL STRUCTURES

M.E STRUCTURAL ENGINEERING

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SUBJECT : ST3262 – INDUSTRIAL STRUCTURES

SEM / YEAR: II/ I

UNIT-I

PLANNING AND FUNCTIONAL REQUIREMENTS

Classification of Industries and Industrial structures - planning for Layout Requirements regarding Lighting, Ventilation and Fire Safety - Protection against noise and vibration - Guidelines of Factories Act.

PART-A

Q.No	Questions	BT Level	Competence
1.	List the major components of an industrial building.	BT-1	Remembering
2.	List the types of fire hazards.	BT-1	Remembering
3.	Define Ventilation.	BT-1	Remembering
4.	Sketch a typical layout of a steel industry and mark its salient features.	BT-1	Remembering
5.	Write down the precautions to be undertaken for controlling vibration.	BT-1	Remembering
6.	Criticize about "Resonance".	BT-1	Remembering
7.	Criticize how protection against noise can be done in industrial Buildings?	BT-2	Understanding
8.	Describe classification of industrial structures.	BT-2	Understanding
9.	State any four preventive measures against fire in industries.	BT-2	Understanding
10.	List the factors that govern the site selection for an industrial building.	BT-2	Understanding
11.	Define the terms Frequency & Amplitude.	BT-2	Understanding
12.	Evaluate the significance of factories act.	BT-1	Remembering
13.	How can be vibrations are measured?	BT-1	Remembering
14.	Classify the different types of structural systems.	BT-1	Remembering
15.	Discuss the minimum front open space is to be provided for factory building as per NBC.	BT-2	Understanding
16.	What are the classification of Building based on occupancy under various groups.	BT-2	Understanding

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17.	State any two requirements for cement industry	BT-1	Remembering
18.	Illustrate the causes for fire in Industrial Buildings.	BT-2	Understanding
19.	Write the sources of noise in Industries.	BT-1	Remembering
20.	Write about factors influencing plant layout.	BT-1	Remembering
21.	Discuss any four preventive measures against fire in industries	BT-1	Remembering
22.	Summarize the major components of an industrial building.	BT-1	Remembering
23.	List the different types of Primary Industry.	BT-1	Remembering
24.	What the industries that are classified under Tertiary industry?	BT-2	Understanding
	PART-B		
1.	Examine in brief the planning, types and elements of an industrial building.	BT-3	Applying
2.	Classify the industries based on the ownership and investment. Explain with suitable example.	BT 4	Analyzing
3.	Explain the classification of industries based on NSSO & NBC.	BT 4	Analyzing
4.	Demonstrate the major guidelines of factories act which forms the base for the industrial structure.	BT-3	Applying
5.	What are the classifications of industrial fire explain in detail??	BT 4	Analyzing
6.	Describe the guidelines for industrial buildings from Factories Act.	BT-3	Applying
7.	Explain the Methods of providing Ventilation and Protection against noise and Vibration in Industrial Buildings.	BT-3	Applying
8.	Demonstrate briefly how the planning for layout requirement is done for an industrial building. Supplement your answer with sketches.	BT 4	Analyzing
9.	Explain in detail about the objective, importance and affecting factors of Plant layout.	BT-3	Applying
10.	Discuss about the firefighting equipment types and its uses.	BT-3	Applying
11.	Plan and write the safety measures to be used to minimize noise and vibration in industries?	BT 4	Analyzing
12.	Draw a typical layout plan for a steel manufacturing industry.Also explain how ventilation can be planned in an industrial building?	BT-3	Applying
13.	List about the technical criteria for the design and basic principles for planning a good layout in a project.	BT-3	Applying
14.	Discuss in detail about the heat or ignition sources	BT-3	Applying
15.	Discuss about the various fire extinguishing agents and extinguishers in detail.	BT 4	Analyzing

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16.	Explain the basic requirement of good plant layout?	BT 4	Analyzing
17.	What are the legal provisions involving high noise levels.	BT 3	Applying
18.	Explain in detail about the different types of layout.		

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UNIT-II INDUSTRIAL BUILDINGS			
Steel and RCC - Gantry Girder, Crane Girders - Design of Corbels and Nibs – Design of Staircase.			
1.	State about gantry girder.	BT 1	Remembering
2.	Write the minimum rise and tread in residential buildings.	BT 1	Remembering
3.	Write about crane girders.	BT 1	Remembering
4.	Explain the loads to be considered for the design of gantry girder.	BT 1	Remembering
5.	Describe corbel and its advantages.	BT 1	Remembering
6.	Evaluate the formula for checking the bending stress in corbel.	BT 1	Remembering
7.	Evaluate why impact factor is considered in the computation of loads acting on gantry girder?	BT 2	Understanding
8.	Summarize the major components of an industrial building.	BT 2	Understanding
9.	List the various effects of cranes to be considered under imposed loads in the design of gantry girder.	BT 2	Understanding
10.	Which section is recommended for gantry girder? Why?	BT 2	Understanding
11.	How will you calculate the load effects on a stairs waist slab spanning in the longitudinal direction?	BT 1	Remembering
12.	Draw a neat sketch by marking the structural components of staircase.	BT 2	Understanding
13.	Define (i) Tread (ii) Rise (iii) Going	BT 1	Remembering
14.	Classify the types of staircases.	BT 2	Understanding
15.	State the functions of corbels.	BT 1	Remembering
16.	Differentiate corbel and nibs	BT 2	Understanding
17.	Draw the stress - strain diagram of corbel for the evaluation of internal force.	BT 1	Remembering
18.	Sketch and point out the reinforcement detailing of a corbel.	BT 1	Remembering
19.	Sketch the reinforcements in nibs with large loads.	BT 2	Understanding
20.	Define drag force.	BT 1	Remembering
21.	What are factors considered while selecting site for industrial building.	BT 2	Understanding

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22.	List out the points to be considered while planning and designing of industrial building.	BT 1	Remembering
23.	Sketch the reinforcements in nibs with lighter loads.	BT 2	Understanding
24.	What are the loads considered in the design of gantry girder.	BT 2	Understanding
	PART-B		
1.	What is a gantry girder? Explain its components and loading considerations in detail.	BT 4	Analyzing
2.	Design the gantry girder for mini building carrying an EOT crane for the following data: Crane capacity = 250 kN. Weight of crane excluding track = 200 kN. Weight of track = 60 kN. Span of Crane between rails = 20mm Minimum hook approach = 1.1m Wheel base = 3.4m Span of Gantry Girder = 7m Mass of rail section = 30 kg/m Height of rails section = 75mm. Take f_y = 250N/mm^2 , E = 2x10^5 N/mm^2.Connection design not required.	BT 3	Applying
3.	An industrial building is to be provided with a hand operated 50 kN crane facility. The details of the building and the gantry girders are: Longitudinal spacing of columns = 6m, Centre to Centre distance of gantry girders= 12m, Wheel spacing = 3m, Edge distance = 1m, Weight of crane girder = 40 kN, Weight of trolley car = 10 kN. Solve the gantry girder for bending and shear.	BT 3	Applying
4.	Design a dog legged staircase for a building in which the vertical distance between the floor is 3.6m. The staircase hall measures 2.5mx5m. The live load may be taken as 2.5kN/m. Use M20 grade concrete and Fe415 steel. Width of each flight is 1.2m	BT 4	Analyzing
5.	A Longitudinal type of a staircase spans a distance of 3.75 m c/c of beams. The flight consists of 15 steps. Take rise = 175 mm, tread is 250 mm. Assuming grade25 concrete and Fe 415 steel, examine the staircase for a live load of 5 kN/m^2. Assuming the breadth of the staircase as 1.4m Design the staircase and Sketch the reinforcement details.	BT 3	Applying
6.	An intermediate flight of a staircase is supported only at the edges of landing (support-Perpendicular to the direction of the flight). Height between landings is 1.5m. The Flight has steps consisting of 10 risers (each rise=150mm) and a treads (each tread=250mm). The steps are supported on a waist slab. Landing is 1 m width. Support width is 300 mm each. Examine the waist slab and landing for bending moment alone. Use M20 concrete and Fe 415 steel. Live load on stair is 3.0kN/m^2. Width of flight = 1.5 m. Design the staircase and Sketch the	BT 3	Applying

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	reinforcement details		
7.	Mention the components and explain different types of stair case in detail with neat sketch.	BT 4	Analyzing
8.	Explain about Corbel and under what circumstances would you use them? Sketch the reinforcement details.	BT 4	Analyzing
9.	Estimate a corbel to support a factored load of 400 kN at a distance of 200mm from the face of the column. The dimension of the column is 300mm x 400mm. Use M25 and Fe 415 steel.	BT 4	Analyzing
10.	Reproduce the design of a RCC corbel to carry a factored load of 500 kN at a distance 200 mm from the face of a 300 x 300 RCC Column. Use M35 concrete and Fe 415 steel.	BT 3	Applying
11.	Design a continuous nib (beam support) projecting from an RCC wall to support a prefabricated slab unit transmitting a service shear froce of 15kN/m, given that the following data Projection of nib = 200mm A_v = 100mm M30 and Fe415 grade of materials.	BT 3	Applying
12.	Design a corbel to support a factored load of 400 kN at a distance of 200mm from the face of the column. The Dimension of the column is 300 x 400mm. use M25 and Fe415.	BT 3	Applying
13.	In what way corbel differ from nib. Justify your answer.	BT 4	Analyzing
14.	Design a flight of staircase for a school building spanning between the landing beams to suit the following data. Number of steps =12, Tread=300mm,Rise=160mm,Width of the landing beam=400mm.Type of staircase is waist slab type. Materials M20 grade concrete and Fe415 steel.	BT 3	Applying
15.	Explain in detail about the procedure for design of Nibs.	BT 3	Applying
16.	Explain in detail about the procedure for design of Corbels.	BT 4	Analyzing
17.	Explain about Nib and under what circumstances would you use them? Sketch the reinforcement details in Nibs with Light loads and large loads.	BT 4	Analyzing
18.	A flight of a dog-legged staircase has the following details: Going =2.25 m Landing width = 1.25 m Raise of a flight = 1.5 m Support width = 300 mm Choosing appropriate dimensions for rise and tread, and taking the flight to span longitudinally between the supports, design the flight. Assume live load as 3 kN/m^2. Design the staircase with data's provided. Sketch the reinforcement details	BT 4	Analyzing

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UNIT-III

POWER PLANT STRUCTURES

Types of power plants – Containment structures - Cooling Towers - Bunkers and Silos – Pipe Rack supporting structures

PART-A

1.	Explain about the nuclear containment structures?	BT 1	Remembering
2.	Evaluate the theories that are adopted for the design of silos.	BT 1	Remembering
3.	State reasons for the use of elevated steel storage tanks.	BT 1	Remembering
4.	Write the Cooling Tower Design Consideration in practice.	BT 1	Remembering
5.	Write the various loads considered in pipe supporting structures.	BT 1	Remembering
6.	List the types of cooling towers.	BT 1	Remembering
7.	Choose the minimum grade of concrete and steel to be used for nuclear containment structures?	BT 2	Understanding
8.	Memorize and state the points to be considered while constructing nuclear containment structures?	BT 2	Understanding
9.	Distinguish between bunker and silo.	BT 2	Understanding
10.	Sketch a typical cooling tower model and name the components.	BT 2	Understanding
11.	Evaluate the precautionary measures to be considered while constructing nuclear containment structures?	BT 1	Remembering
12.	Differentiate between free vibration and forced vibration.	BT 2	Understanding
13.	List the different types of power plants	BT 2	Applying
14.	List few power companies in India	BT 1	Remembering
15.	Examine the structural elements of bunker with neat sketch.	BT 2	Applying
16.	Illustrate the theories used for calculation vertical weight carried by the wall due to compression in silos.	BT 1	Remembering
17.	Explain about the stresses that the RCC chimney is subjected.	BT 2	Applying
18.	Write the steps involved in design of rectangular bunkers.	BT 1	Remembering

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19.	Identify the assumptions made in the design of silos by Janssen's theory.	BT 1	Remembering
20.	Draw a neat sketch of a bin and list its components.	BT 2	Applying
21.	What are the 3 types of silos?	BT 1	Remembering
22.	What are silos used for?	BT 2	Understanding
23.	What are the three main types of bunker?	BT 2	Understanding
24.	How did silos work?	BT 2	Understanding
	PART-B		
1.	Draw the typical layout of nuclear power plant structures.	BT 4	Analyzing
2.	Explain the design procedure of cooling tower.	BT 4	Analyzing
3.	Explain the various factors increasing the bin loads.	BT 3	Applying
4.	Show the design procedure of silos in detail.	BT 4	Analyzing
5.	In what way, bunker differs from a silo? Explain in detail.	BT 3	Applying
6.	Show the design procedure of bunkers in detail.	BT 4	Analyzing
7.	Describe the factors to be borne in mind while designing nuclear containment structures.	BT 4	Analyzing
8.	Describe about cooling towers and its types.	BT 3	Applying
9.	Write about power plant structures and its types in detail.	BT 3	Applying
10.	Describe about the construction methodologies and related aspects of power plant structures.	BT 4	Analyzing
11.	Design a circular cylindrical bunker to store 20 t of coal. Density of coal is 9 kN/m^3. Angle of repose is 30˚. Adopt M 20 grade of concrete and Fe 415 steel. & Sketch the details of reinforcements.	BT 3	Applying
12.	What do you mean by cross flow & counter flow in cooling towers?	BT 4	Analyzing
13.	Analyze the concept of AIRY'S Theory for the design of bunkers and silos.	BT 4	Analyzing
14.	Design the side walls and hopper bottom of 3mx3m square bunker to store 30 tonnes of coal. Density of coal = 9 kN/m^3. Angle of repose = 30^0 Degree. Adopt M20 grade of concrete and Fe415 HYSD bar. Sketch the details of reinforcement in the bunker.	BT 3	Applying

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15.	Enumerate in detail about the difference between Bunker's and Silos.	BT 4	Analyzing
16.	Design the side walls of a rectangular bunker of capacity 300kN to store coal using M20 concrete and Fe415 steel. Given unit weight of coal = 8 kN/m^3, angle of repose of coal = 25^0.	BT 3	Applying
17.	Design the hopper bottom of a rectangular bunker of capacity 300kN to store coal using M20 concrete and Fe415 steel. Given unit weight of coal = 8 kN/m^3, angle of repose of coal = 25^0.	BT 4	Analyzing
18.	Design the side walls and hopper bottom of a circular bunker of capacity 300 kN to store coal using M20 concrete and Fe415 steel. Give the unit weight of coal = 8kN/m^3, angle of repose of coal = 25^0.	BT 4	Analyzing

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UNIT-4

TRANSMISSION LINE STRUCTURES AND CHIMNEYS

Analysis and design of steel monopoles, transmission line towers – Sag and Tension calculations, Methods of tower testing – Design of self-supporting and guyed chimney, Design of Chimney bases.

1.	List the components of power cables.	BT 1	Remembering
2.	Classify the types of chimneys.	BT 1	Remembering
3.	Draw a neat sketch of a single diagonal braced tower.	BT 1	Remembering
4.	Justify why is lining provided for chimneys?	BT 1	Remembering
5.	Discuss the factors for the stress developed in Chimney.	BT 1	Remembering
6.	Define sag in towers.	BT 1	Remembering
7.	Evaluate the factor of safety adopted for the design of structural members of steel transmission line towers?	BT 2	Understanding
8.	Write the types of structures which support the electric power transmission lines.	BT 2	Understanding
9.	Define the term: wind span and Weight span	BT 2	Understanding
10.	List the types of towers recommended as per the codal provisions.	BT 2	Understanding
11.	Describe what do you understand by broken wire condition?	BT 1	Remembering
12.	Criticize the transmission line towers?	BT 2	Understanding
13.	Write short notes on guyed chimneys.	BT 1	Remembering
14.	Write the different types of power cables?	BT 2	Understanding
15.	Explain about the requirements of substation structures	BT 1	Remembering
16.	List the points to be considered while selecting a site for substation	BT 2	Understanding
17.	Examine the advantages of fire brick lining in RC Chimneys.	BT 2	Understanding
18.	Estimate the wind forces on 60m high tower with a basic wind speed of 45m/sec.	BT 1	Remembering
19.	List the materials used for constructing substation structures.	BT 2	Understanding
20.	Mention the components of self-supporting chimney with neat sketch.	BT 1	Remembering

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21.	What are the failures of chimney?	BT 2	Understanding
22.	Where is chimney used?	BT 1	Remembering
23.	What are the dangers of a chimney?	BT 2	Understanding
24.	What are the two types of transmission lines?	BT 2	Understanding
PART-B			
1.	Illustrate with sketches describe the various lattice tower configurations with bracing systems.	BT 4	Analyzing
2.	Enlist and explain in detail about the Main Components of Transmission Tower.	BT 3	Applying
3.	Discuss about the design data guidelines for transmission line towers.	BT 3	Applying
4.	Explain the following a) Self-supporting tower b) Guyed towers c) Monopole	BT 4	Analyzing
5.	Show and explain the forces acting on steel chimney	BT 3	Applying
6.	Explain about loading and load combinations in transmission line towers?	BT 3	Applying
7.	Summarize the different bracing systems adopted in transmission line tower.	BT 4	Analyzing
8.	List and explain the step by step design procedure of Chimney.	BT 4	Analyzing
9.	Reproduce the design of a self-supporting steel chimney for a height of 40 m above foundation with diameter of cylindrical portion 2 m. Assume thickness of lining as 100 mm and wind pressure as 1.5 kN/m^2.	BT 4	Analyzing
10.	A concrete chimney of height 80m with external diameter of shaft being 4m at top and 5m at bottom is required in a place where wind intensity is 1.5kN/m^2. Thickness of fire lining is 10 cm. temperature differences between inside and outside of the shaft is 75^0C. Permissible bearing pressure on soil at site is 150kN/m^2. Adopt M25 and Fe415 and design the base of the chimney.	BT 3	Applying
11.	Distinguish in what way design of self-supporting chimney and guyed chimney differ?	BT 3	Applying
12.	Analyze and design a transmission line tower with sag-tension Calculation with a example.	BT 3	Applying
13.	Describe the behavior of RC and Steel chimney.	BT 4	Analyzing
14.	Discuss about power cables & control cable in transmission line towers.		

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15.	Design a self supporting steel stack of 72m height above the foundation is located at delhi. The diameter of cylindrical part of chimney is 3m. the foundation has to rest on medium soil having bearing capacity of 200kN/m^2. The thickness of fire brickwork lining is 100mm and is supported by the stack throughout the height. The topography of the site is almost flat and the location is of terrain category 2.	BT 3	Applying
16.	Explain about the various forces acting on the self-supporting steel chimney?	BT 4	Analyzing
17.	Described about the various flue opening in steel chimney.	BT 4	Analyzing
18.	Explain the various methods adopted for testing of towers.	BT 3	Applying

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UNIT-5

FOUNDATION

Foundation for Towers, Chimneys and Cooling Towers –Design of Block foundations for machines - Design of Turbo Generator Foundation.

1.	State the general requirements of machine foundations?	BT 1	Remembering
2.	Illustrate the points to be considered in the design of foundation for towers?	BT 1	Remembering
3.	Evaluate the various parameters influencing the design of a machine foundation.	BT 1	Remembering
4.	Describe about turbo-generator foundation.	BT 1	Remembering
5.	Categorize the types of loads to be considered for tower foundation	BT 1	Remembering
6.	List and name the methods used for dynamic investigation of soil at the site.	BT 1	Remembering
7.	How the safety of tower foundation is checked against uplift?	BT 2	Understanding
8.	List the types of machine foundation.	BT 2	Understanding
9.	Discuss the IS codes to be followed for the satisfactory performance of a cooling tower foundation?	BT 2	Understanding
10.	Discuss about foundation used for self-supporting steel chimney?	BT 2	Understanding
11.	Enlist critical parameters of transmission line towers.	BT 1	Remembering
12.	Discuss the factors to be checked on tower foundation?	BT 1	Remembering
13.	Write the formula used for checking the uplift capacity of tower foundation.	BT 2	Applying
14.	Which types of foundation is well suited for turbo generator machines.	BT 1	Remembering
15.	Indicate the general design criteria for the satisfactory performance of a tower foundation.	BT 2	Applying
16.	Define solidity ratio.	BT 1	Remembering
17.	Explain the method of selecting a proper type of foundation for transmission.	BT 1	Remembering
18.	Write the types of tower foundation?	BT 2	Applying

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19.	Demonstrate the stability analysis for tower foundation.	BT 1	Remembering
20.	Write about Pad Foundation.	BT 2	Applying
21.	How to design a tower foundation?	BT 1	Remembering
22.	What is the name of Tower Foundation?	BT 2	Understanding
23.	What makes a good tower structure?	BT 2	Understanding
24.	What is the main function of tower?	BT 2	Understanding
	PART-B		
1.	Discuss the design criteria involved while designing foundation for Reciprocating machine foundation.	BT 4	Analyzing
2.	Explain in detail different types of machine foundation.	BT 4	Analyzing
3.	Enumerate the step by step design criteria for turbo generator foundation.	BT 3	Applying
4.	Illustrate the method of selecting a proper type of foundation?	BT 4	Analyzing
5.	Describe the important codal stipulations for R.C.C Tower foundations?	BT 3	Applying
6.	Design the foundation for a lathe. Which has the following characteristics. Weight of machine = 150 kN Base area = 1.2mx5.0m, Height of CG of machine = 0.9m The machine supported by 3 pairs of bolts @ 2.5mc/c Allowable amplitude = 0.1mm Use M20 grade concrete and Fe415 steel Speed of the machine =1200rpm Mass moment of Inertia I_{mm} = 7500 kg/m^3 Vertical Excitation Force F_z =50 kN Allowable Bearing Stress = 110kN/m^2	BT 4	Analyzing
7.	Employ how stability against overturning, uplift and lateral thrust is checked in tower foundation design.	BT 4	Analyzing
8.	Write down the design procedures adopted for the foundation of chimneys.	BT 3	Applying
9.	Explain design principles adopted for foundation of cooling towers.	BT 3	Applying
10.	Write in detail about the Masts and Trestles.	BT 4	Analyzing
11.	Outline the general philosophy in the design of Concrete Pad & chimney foundation.	BT 3	Applying

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12.	Give the necessary Basic Concept and forces action on Transmission Tower Foundation.	BT 4	Analyzing
13.	Examine the vibration effects to be considered in design of machine foundation.	BT 4	Analyzing
14.	Record the bulb of pressure concept proposed by "Balakrishna Rao" for the design of Machine foundations.	BT 3	Applying
15.	Design the forces on tower leg Ultimate compression : 147t Ultimate tension : 121.25t Ultimate shear : 8.25t Soil data Soil Type : Hard laterite Site location : Mangalore In-situ N for 5m depth is >75 In-situ density = 2.05 t/m^3 $\phi=40^0$,C = 0.52 kg/cm^2,N_c=75,N_q=64,N_r=104 Ground water table at 6.5 m below ground level.	BT 4	Analyzing
16.	Design the forces on tower leg Ultimate compression : 81.5t Ultimate tension : 63.0t Ultimate shear : 1.8t Soil data Soil Type : silt clay(medium) Site location : Annanagar (Madras). In-situ $N_{corrected}$ for overburden upto 5m depth = 7. In-situ density = 1.85 t/m^3,C = 0.42 kg/cm^2, Ground water table at 3.5 m below ground level.	BT 3	Applying
17.	Explain in detail about the various steps adopted for considering the stability analysis of tower foundation.	BT 4	Analyzing
18.	Discuss in detail the various types of foundations used for towers.	BT 4	Analyzing

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