VALLIAMMAI ENGINEERING COLLEGE
KATTANKULATHUR

ST7014-INDUSTRIAL STRUCTURES

QUESTION BANK

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UNIT-1

PLANNING AND FUNCTIONAL REQUIREMENTS

PART-A

1. On what basis Industrial structures are classified?
2. Define Ventilation.
3. What are the causes for fire in Industrial Buildings?
4. Mention the sources of noise in Industries.
5. Explain Natural Ventilation.
6. What is "Resonance"?
7. How protection against noise can be done in industrial buildings?
8. Mention the major components of an industrial building?
9. What is the minimum front open space is to be provided for factory building as per NBC?
10. List the factors that govern the site selection for an industrial building.
11. Define fire load.
12. What is the significance of factories act?
13. State the characteristic features of fire resisting material?
14. What are the different types of structural systems?
15. What are the general requirements of steel industry
16. List the major components of an industrial building?
17. List the types of fire hazards.
18. State any two requirements for cement industry
19. What is the importance of factories act?
20. Write short notes on guidelines from factories act.

PART-B

1. a. Give the guidelines for industrial buildings from Factories Act.
   b. What are the factors that govern the choice of roofs for Industrial Buildings?
2. Explain
   (i) Methods of providing Ventilation.
   (ii) Protection against noise and Vibration in Industrial Buildings.
3. Discuss briefly how the planning for layout requirement is done for an industrial building. Supplement your answer with sketches.
4. State the important guidelines from Factories act with reference to planning of industrial buildings.

5. State the important guidelines from Factories act with reference to planning of industrial buildings.
6. How would you ensure protection against noise and vibration in industries? Also list out the general fire safety requirement for an industrial building.
7. Draw a typical layout plan for a steel manufacturing industry. Also explain how ventilation can be planned in an industrial building?
9. Discuss the methods of fire extinguishing techniques adopted in an industry.
10. Explain in brief the planning, types and elements of an industrial building.
11. Plan a layout for a cement industry which should satisfy all the requirements.
12. Explain about the classification of lightning? What are the points to be considered for providing natural lighting and ventilation

UNIT-2
INDUSTRIAL BUILDINGS
PART-A

1. What is a gantry girder?
2. Sketch the reinforcements in nibs with large loads.
3. Explain corbel and its advantages?
4. What are the assumptions that are made in corbels according to Indian practice?
5. Why impact factor is considered in the computation of loads acting on gantry girder?
6. When will you classify a cantilever projection from a column as a corbal?
7. State the functions of corbels.
8. List the various effects of cranes to be considered under imposed loads in the design of gantry girder.
9. What is a stair case.
10. Define (i) Tread, (ii) Rise, (iii) Going
11. Define tread Riser.
12. Define tread Going.
13. What are the types of staircases?
14. What is a flight?
15. What is the minimum rise and tread in residential buildings?
16. What is the minimum rise and tread in public buildings?

17. Mention the places where the following footings can be used a). Single flight staircase b). Quarter turn staircase c). Dog legged staircase d). Open well staircase e). Spiral staircase?
18. Write the live load specification as per code specification.

PART-B

1. Design a Gantry Girder for the following data

   Crane capacity- 100kN

   Longitudinal Spacing of Columns - 8m

   Gantry Girder spacing - 15m

   Wheel spacing of Crane - 3.2m

   Edge distance - 1m

   Weight of Crab Car - 16kN

   Weight of Crane Girder - 100kN

2. Design a gantry girder for a yarn packing industry for the following data:

   Crane capacity = 250 kN

   Weight of crane (excluding crab) = 200 kN

   Weight of crab girder = 50 kN

   Mini. Hook approach = 1.2m

   Wheel base distance = 3.5 m

   C/C Spacing of Columns = 16 m

   C/C Spacing of gantry rail = 16 m

   Self-weight of rail section = 300 N/m

   Depth of rail section = 75 mm

   Take f_y = 250 N/mm^2, E = 2 x 10^5 N/mm^2

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. Design the gantry girder for bending and shear.

4. Design 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.

5. Design a corbel for a 250 mm square column to support a vertical ultimate load of 400 kN

with its line of action 170 mm from the face of the column. Assume M20 grade of concrete and Fe 415 steel.

6. What is a Nib and under what circumstances would you use them? Sketch the reinforcement details in Nibs with a) Light loads b) Large loads.
7. 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 grade 25 concrete and Fe 415 steel, design the staircase for a live load of 5 kN/m^2. Assuming the breadth of the staircase as 1.4 m.
8. 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. Design 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.

9. 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.

10. Design a dog-legged stair for a building in which the vertical distance between the floors is 3.6m. The Stair hall measures 2.4m x 5m (inner dimensions). The live load on the stair is 3000N/m^2.Adopt M20 Grade concrete and Fe415Grade Steel.

UNIT-3
POWER PLANT STRUCTURES
PART-A

1. What are nuclear containment structures?
2. What is the minimum grade of concrete and steel to be used for nuclear containment structures?
3. What are the precautionary measures to be considered while constructing nuclear containment structures?
4. Explain the types of power plants.

5. Explain the requirement of power plants.
6. What are the precautionary measures to be considered while constructing nuclear containment structures?
7. Differentiate between free vibration and forced vibration.
8. List the different types of power plants
9. List few power companies in India.
10. Explain the structural elements of bunker with neat sketch.
11. What are the theories used for calculation vertical weight carried by the wall due to compression in silos.
12. Distinguish between a bunker and a silo.
13. What are the steps involved in design of rectangular bunkers.
14. What are the assumptions made in the design of silos by Janssen's theory.
15. Draw a neat sketch of a bin and list its components.
16. Name the theories that are adopted for the design of silos.
17. State reasons for the use of elevated steel storage tanks.

PART-B

1. Draw the typical layout of nuclear power plant structures.
2. Discuss the factors to be borne in mind while designing nuclear containment structures.
3. Draw the typical layout of hydro power plant structures
4. Explain the main factors to be allowed for design of RC containment structures.
5. Explain about the construction methodologies and related aspects of power plant structures.
6. Using Jansen's theory, derive an expression for horizontal pressure in a silo at any depth *h* below the top. Also derive an expression for total vertical load of the material transferred to the walls.
7. Design a circular cylindrical bunker to store 20 t of coal. Density of coal is 9 kN/m^3. Angle of repose is 30˚. Sketch the details of reinforcements. Adopt M 20 grade of concrete and Fe 415 steel.
8. A circular cylindrical bunker is to be designed to store 300 kN of coal having a unit weight of 8 kN/m^3. The stored coal is to be surcharged at an angle of repose which is 30˚ for coal. Design the walls and hopper bottom. Sketch the details of reinforcements.

Adopt M 20 grade of concrete and Fe 415 steel.

9. A cylindrical silo has an internal diameter of 10 m with the height of cylindrical portion is 40 m. The density of material is 15.2 kN/m^3. The coefficient of friction between material and concrete is 0.70. The angle of repose of the material is 17.5 degrees. Design the thickness and reinforcements required at the bottom of the cylindrical portion of the silo. Adopt M 20 grade of concrete and Fe 415 steel.
10. Explain the difference between the bunkers and silos.
11. Discuss the design principle of cooling towers.
12. Explain the design procedure of cooling tower.

UNIT-4
TRANSMISSION LINE STRUCTURES AND CHIMNEYS
PART-A

1. Name the types of towers recommended as per the codal provisions.
2. What is the factor of safety adopted for the design of structural members of steel transmission line towers?
3. Name the types of structures which support the electric power transmission lines.
4. Define the term: wind span.
5. Explain the term: weight span.
6. What do you understand by broken wire condition?
7. What are the transmission line towers?
8. Write short notes on testing of towers
9. What are the different types of power cables?
14. What are the components of RCC Chimney.
15. Mention the components of a cooling tower.
16. Classify the types of chimneys.

PART-B

1. Discuss briefly about Transmission line towers.
2. What are the loads to be considered in the design of transmission line towers?
3. Under what circumstances testing of towers is necessary?
4. (i)Write a detailed note on the different types of loads acting on transmission line towers.(8M)

   (ii)Give a brief discussion on lateral loads due to wind on transmission towers recommended

as per the Indian codal provisions.(8M)

5. Sketch the elevations of different types of transmission line towers. State the assumptions made in the analysis and discuss about the loading conditions to be considered in the design.
6. Explain the detail the testing of power transmission line towers.
7. Design a Chimney of 40m height having external diameter of 2.5m throughout the height. The chimney has a fire brick lining 10cm thick for 20m height above base. Air gap is 8cm. Temperature of gases is expected to be 200°C more than the temperature of the surrounding air. Coefficient of thermal expansion for concrete and steel is a = 11x 10-<>*I* °C and Es = 2.05 x 107 *N/Cm2.* Use M20 concrete. Density of lining is 19,500 *N/m3* and that of concrete *24,000N/m3*
8. Explain the design procedure of RC Chimney
9. Design 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.
10. A self supporting steel chimney is 60 m high and 3 m diameter at top. Design the thickness of plate required at 30 m and 60 m from top. Also design the base plate and the anchor bolts. Assume wind pressure as 1.5 kN/m^2

UNIT-5
FOUNDATION
PART-A

1. What are the general requirements of machine foundations?
2. State the general requirements of a machine foundation.2
3. Mention the various parameters influencing the design of a machine foundation.
4. State the general requirements of data for the design of machine foundation.
5. What is the effect of impact load in machine foundation?
6. Name the methods used for dynamic investigation of soil at the site.
7. Where are the cooling towers widely used?
8. What are the stresses subjected to RCC Chimney?
9. Distinguish between bunker and silo.
10. What do you understand by self supporting steel chimney?
11. Why Rankine’s theory is not adopted for the design of silos? Give reason.
12. What are the forces acting on tower foundation?

13. Explain distribution substation.
14. List the materials used for constructing substation structures.
15. Explain the functions of substations.
16. Define solidity ratio
17. What are the points to be considered while selecting site for substation?
18. What are the types of tower foundation?
19. What are the requirements of substation structures
20. Mention the different types of foundations used for towers.
21. What type of foundation is adopted for towers?
22. Write about substation structures

PART-B

1. Describe the steps involved while designing foundation for reciprocating machines.
2. Explain in detail different types of machine foundation.
3. Explain the design procedure for turbo generator foundation.
4. Enumerate the steps in the design of tower foundations and explain their silent features.
5. (i) How the foundation for towers be designed for various loads acting on it?
6. (ii)Write a short note on Masts and Trestles.(8M)
7. Sketch and discuss in detail the various types of foundations used for towers.
8. How the foundation for towers be designed for various loads acting on it?