

Code No: R204101A

R20

SET - 1

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
IV B. Tech I Semester Advanced Supplementary Examinations March 2025

ADVANCED STRUCTURAL ENGINEERING

(Civil Engineering)

Time: 3 hours

Max. Marks: 70

Answer any **FIVE** Questions. **ONE** Question from **Each unit**

All Questions Carry Equal Marks

Note: IS 456:2000 Codebook shall be allowed in the examination hall

UNIT-I

1. a) Describe the types of loads that a raft foundation is designed to resist. How does the size and shape of a raft foundation affect the distribution of loads? [7M]
b) A raft foundation is designed to carry a total load of 2000 kN. The length of the foundation is 12m, and the width is 10m. The soil has a shear strength of 100 kN/m². Calculate the shear force acting on the foundation and determine the required shear reinforcement. Assume that the concrete has a compressive strength of 25 MPa. [7M]

(OR)

2. a) Explain the design principles of raft foundations with a neat sketch. [7M]
b) A cantilever retaining wall is designed to retain 4m of backfill with a soil density of 18 kN/m³ and an angle of repose of 30°. Assume a coefficient of active earth pressure $K_a = 0.33$. Find the total lateral earth pressure on the wall and the overturning moment at the base of the wall. [7M]

UNIT-II

3. a) Discuss the design procedure of a circular water tank with a flexible base. [7M]
b) A circular RCC water tank has an internal diameter of 8m and a water depth of 5m. The tank is resting on the ground. Density of water = 10 kN/m³. Find the hoop tension at the base and mid-height of the tank and thickness of the tank wall assuming M25 grade concrete and Fe415 steel. [7M]

(OR)

4. a) Discuss the structural components of an Intze tank with a neat diagram. [7M]
b) An Intze water tank is required to store 300,000 liters of water. Tank height (from ground level to top) = 22m, diameter of cylindrical portion = 10m, Conical portion angle = 45° and Self-weight of tank = 12% of stored water. Find the depth of the cylindrical and conical portions, the total weight of the tank including self-weight and water and check stability against overturning due to wind pressure of 1.5 kN/m². [7M]

UNIT-III

5. a) Derive the punching shear equation and explain how punching shear failure occurs? [7M]
b) A flat slab of 10m × 10m is supported on four interior columns of 400mm diameter each. The slab thickness is 200mm, and the total live load on the slab is 5 kN/m². Concrete Grade = M30 and Steel Grade = Fe500. Find column strip and middle strip moments using the Direct Design Method and the required reinforcement in the slab. [7M]

(OR)

6. a) Explain the Equivalent Frame Method (EFM) with a neat sketch. [7M]
b) A flat slab system is designed for an office building. The panel size is $5\text{m} \times 5\text{m}$, column size $400\text{mm} \times 400\text{mm}$, and the slab thickness is 200mm . Check for punching shear at an interior column using IS 456:2000 provisions. [7M]

UNIT-IV

7. a) Explain in detail the design procedure of an RCC chimney, including load considerations, stress analysis, and reinforcement detailing. [7M]
b) A 90m high RCC chimney is designed to carry hot gases at 200°C . Calculate the temperature stresses developed due to the temperature difference between the inner and outer surfaces. [7M]

(OR)

8. a) Discuss the importance of reinforcement detailing in RCC chimneys and its role in preventing failures. [7M]
b) A tapered RCC chimney has a thickness varying from 400mm at the base to 200mm at the top. Calculate the dead load and stability factors. [7M]

UNIT-V

9. a) List the different types of pressed steel tanks and their applications? [7M]
b) A cylindrical pressed steel tank has a diameter of 6m and a height of 5m . Calculate the hoop stress and thickness of the steel plates required. [7M]

(OR)

10. a) Explain the types of joints used in pressed steel tanks and their structural importance. [7M]
b) A rectangular pressed steel tank has dimensions $5\text{m} \times 4\text{m} \times 3\text{m}$. Determine the water pressure distribution on the tank walls. [7M]
