

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (S, FE) / S4 (PT) (S,FE) Examination May 2024 (2015 Scheme)

**Course Code: CE304****Course Name: DESIGN OF CONCRETE STRUCTURES - II**

Max. Marks: 100

Duration: 3 Hours

*Use of IS 456, IS 1343, IS 3370 and design charts of SP 16 is permitted.**Assume any missing data suitably.***PART A***Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) Design a reinforced concrete short column 300 mm x 400 mm carrying a factored axial load of 1500 kN and factored moment of 150 kN-m about its major axis. Use M20 concrete and Fe 415 steel. (10)
- b) Explain the design procedure of a short column under biaxial bending (5)
- 2 a) What is a combined footing? Explain with sketches the different types of combined footings and the situations in which each type of combined footing is used. (8)
- b) Explain axial load - moment interaction curves for columns and explain the salient points on interaction curves. (7)
- 3 a) Design an isolated footing for a rectangular column 230 × 450 mm, carries an axial load of 1500 kN. The SBC of the soil is 150 kN/m². Use M 20 concrete and Fe 415 steel. (15)

PART B*Answer any two full questions, each carries 15 marks.*

- 4 a) A cantilever retaining wall is designed to retain level earth for a height of 4.2 m. The safe bearing capacity of soil is 180kN/m² and unit weight of soil is 18kN/m³. Coefficient of friction between soil and concrete is 0.6. Angle of internal friction is 30°. Use M20 and Fe415 steel. Proportion the retaining wall and check for its stability. Also design and detail the stem of the retaining wall. Assume good soil for foundation at a depth of 1.5m below the ground level. (15)
- 5 a) Design a circular roof slab, fully restrained at edges, of inside diameter 6m and support thickness 300 mm. The slab supports a live load of 4.5kN/m² and a floor (15)

finish of 1 kN/m^2 . Use M30 concrete and Fe 415 grade steel. Sketch the reinforcement details.

- 6 a) Design and detail a spherical dome of span 10m and rise 1.8m. Live load is 2 kN/m^2 . Use M20 concrete and Fe 415 steel. Design ring beam at base also (15)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Design a circular water tank of capacity 1,50,000 litres resting on the ground and having a flexible base. Depth of water is 3m including free board of 0.25m. Use M25 concrete and Fe415 steel (20)
- 8 a) A prestressed concrete beam of symmetrical I section spanning 10 m has the width and depth of flanges equal to 200 mm and 50 mm respectively. Overall depth of beam is 500 mm and web thickness is 80 mm. The beam is prestressed by a parabolic cable with an eccentricity of 150 mm at mid span and zero at the support. Effective prestress at working stage is 100 kN. Live load is 3 kN/m . Draw the stress distribution diagrams at the mid span for (a) Initial stage and (b) Final stage. Loss of prestress is 15% (20)
- 9 a) A prestressed concrete beam 200 mm wide and 300 mm deep is prestressed with high tension wires of area 320 mm^2 located at a constant eccentricity of 50 mm. Initial stress 1000 N/mm^2 . Span is 10 m. Calculate the percentage loss of prestress if it is pre-tensioned. $E_s=210\text{ kN/mm}^2$; $E_c=35\text{ kN/mm}^2$; Relaxation loss is 5%; shrinkage strain = 3×10^{-4} ; creep coefficient = 1.6. (15)
- b) Explain the stresses developed in walls of circular water tanks. (5)
