Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (S, FE) / S4 (PT) (S, FE) Examination January 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 are permitted
Assume any missing data suitably

PART A

Answer any two full questions, each carries 15 marks. Marks

1 a) What is the difference in the structural behaviour of braced slender column and unbraced slender column? (5)

b) Design a rectangular reinforced concrete column of size 300 mm x 400 mm subjected to a working load of 1000kN and a working moment of 250 kNm with respect to the major axis. The column has an unsupported length of 3m and the effective length ratio may be assumed as 0.85. Use M25 grade concrete and Fe 415 grade steel. (10)

2 a) What are the situations in which a footing is eccentrically loaded? (3)

b) Design and detail an isolated column footing for a square column 400 mm x 400 mm, reinforced with 6 no's of 20 mm diameter bars, carrying a service load of 2000 kN. Assume founding soil is with SBC of 270 kN/m^2. Use M25 grade concrete and Fe 415 grade steel. (12)

3 a) Design the longitudinal reinforcement for a column of size 300 mm x 400 mm, subjected to a factored axial load of 1800kN and factored moments of 100kNm and 50 kNm with respect to the major and minor axis respectively. Assume that the column is bent in double curvature (in both directions). Use M35 concrete and Fe 415 grade steel. (15)

PART B

Answer any two full questions, each carries 15 marks.

4 Proportionate a cantilever retaining wall required to support a bank of earth 3.5m high above the ground level. Consider the back fill surface to be level. Assume good soil for foundation at a depth of 1.5 m below the ground level with a SBC of 150kN/m^2. The backfill soil has a unit weight of 15kN/m^3 and an angle of internal friction of 30°. Assume the coefficient of friction between soil and concrete to be 0.5. Also design and detail the stem slab. (15)

5 Design a spherical dome which has a span of 9 m and rise of 3m. The live load is estimated to be 1.2 kN/m^2. Use M20 grade concrete and Fe 415 steel. Ring beam at the base should also be designed. (15)

6 a) Explain the types of stresses developed in spherical domes. (3)

b) Design a circular roof slab of diameter 4 m, to carry a super imposed live load of 4kN/m^2. The slab is simply supported at the edges. Use M20 concrete and Fe 415 grade steel. (12)

PART C

Answer any two full questions, each carries20 marks.

7 Design a circular water tank with fixed base for a capacity of 3,50,000 litres. Depth of water is 4m including a free board of 0.25 m. The tank is free at top and rests on ground. Use M30 grade concrete and Fe 415 steel. The unit weight of water may be assumed as 10kN/m^3. (20)

8 a) Explain any two types of pre stressing. (8)

b) A concrete beam of size 300 mm x 500 mm is pre stressed by 8 no's of 7 mm diameter wires located at 100 mm from the soffit of the beam. The wires are tensioned to a stress of 1500 N/mm^2 in the wires. The beam is located in an area with relative humidity 80%. The beam is exposed to environment through all the three sides except the top 300 mm width. After 7 days of curing, the beam is stressed. The grade of concrete is M45 and grade of steel used is Fe 500. The modulus of elasticity of steel is 210 kN/mm^2. (12)

Using the methods specified in IS 1343: 2012, compute

(i) the loss due to elastic shortening and

(ii) the loss of prestress due to shrinkage of concrete at the age of 28 days

9 a) With the help of sketches, write short notes on any two types of joints in water tanks. (4)

b) A pre stressed concrete beam is of 100 mm wide and 300 mm deep. The span of the beam is 10m. It is prestressed using straight tendon, located at an eccentricity of 50 mm. The effective pre stressing force in the beam is 300 kN. The beam supports a live load of 1.5 kN/m. Use M35 grade concrete and Fe 500 grade steel. The unit weight of concrete may be assumed as 25 kN/m^3. (16)

Calculate the resultant stress distribution at the centre span of the cross section.

Also, find the magnitude of the prestressing force to be applied at the same location which can balance the stresses due to dead and live loads at the bottom of the centre span.

****