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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (S, FE) / S3 (PT) (S, FE) Examination December 2023 (2015 Scheme)

Course Code: CE301

Course Name: DESIGN OF CONCRETE STRUCTURES I

Max. Marks: 100 Duration: 3 Hours

Use of IS 456-2000 is permitted

PART A

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

1 a) Derive the expressions for stress block parameters in limit state of flexure and hence the expression for moment of resistance of a singly reinforced rectangular section. (5)

b) Define characteristic strength of materials (concrete and steel). (3)

c) A concrete beam has 230 mm breadth and 500 mm effective depth. It is reinforced with 3 Nos. 20 mm diameter steel bars at tension side. The effective cover is taken as 50 mm.M25 concrete and Fe 500 grade steel are used. Determine the moment of resistance of the section. (7)

2 a) Explain design loads and design strength of material. (3)

b) Design the shear reinforcement for a simply supported reinforced concrete beam of span 4.5m having width 230 mm and depth 550 mm. Effective cover to reinforcement 50mm.It is carrying a superimposed load of 10 kN/m. The beam is reinforced with 4 bars of 20 mm diameter. Use M25 concrete and Fe 415 grade steel. (12)

3 a) What is bond in reinforced concrete? Define development length and derive an expression for development length. (5)

b) A 230 mm wide reinforced concrete beam with 450 mm effective depth is reinforced with 3 numbers 16 mm diameter bars of Fe 415 grade steel. The effective cover for the beam is 50 mm. The beam is provided with 8 mm diameter 2 legged vertical stirrups at 140 mm c/c as shear reinforcement and one of the longitudinal bars is bent up at 45^0 near to support. Determine the design strength of the section in shear. The concrete used for construction is of M20 grade. (10)

PART B

Answer any two full questions, each carries 15 marks.

4 a) Describe with sketches two situations where design for torsion is necessary in RC structures. (5)

b) Design a singly reinforced concrete beam of rectangular section subjected to a uniformly distributed live load of 10 kN/m over the entire span and a concentrated load of 4 kN at the mid span. Clear span of the beam is 3 m. The beam is supported on masonry walls of 230 mm thick on both sides. Assume moderate exposure conditions. Use M30 grade concrete and Fe 415 grade steel. (10)

5 Design and detail a simply supported reinforced concrete slab 3 m x 8 m for a verandah. Assume a live load of 5 kN/m^2. The slab is supported with 230 mm thick walls around. Use M25 concrete and Fe415 grade steel. (15)

6 a) Draw the longitudinal and cross sections showing the reinforcement detailing for a cantilever beam. (5)

b) Design the longitudinal reinforcement required for a reinforced concrete beam having breadth 300 mm and total depth 650 mm and effective cover to reinforcement 50 mm to carry a factored torsional moment of 70 kNm, a factored shear force of 120 kN and a factored moment of 100 kNm. Use M30 concrete and Fe 415 steel. (10)

PART C

Answer any two full questions, each carries20 marks.

7 Design an RCC slab for a room 4 m x 5 m clear in size is to carry a live load of 3 kN/m^2. Use M20 concrete and Fe 415 steel. The edges are simply supported and the corners are held down. Draw top plan and bottom plan to show the reinforcement detailing. (20)

8 a) Mark the edge and middle strip portions of a two way slab and explain the differences in their action. Give IS rules for reinforcing these strips. (5)

b) Write down the steps to compute the short term and long term deflection of concrete. (5)

c) Design a short column of size300 mm x 400 mm subjected to a axial load of 2000 kN. Use M30 concrete and Fe 500 steel. (10)

9 a) Sketch the reinforcement detailing of a tread-riser type stair. (5)

b) Design a short circular column of RCC of M30 grade, to carry a axial load of 2000kN. The column is of 50 cm in diameter. The unsupported length of the column is 4 m. The column is held in position and restrained against rotation at both the ends. Also design the helical reinforcement for the column. Use Fe415 steel. (15)

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