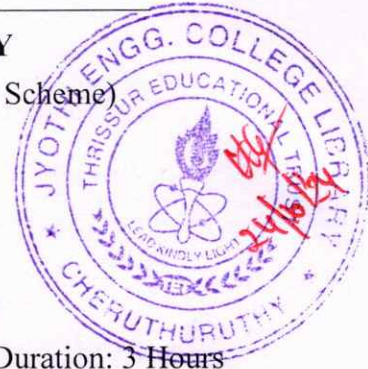


Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

B.Tech Degree S5 (S, FE) / S3 (PT) (S) Examination June 2024 (2019 Scheme)

**Course Code: CET 303****Course Name: DESIGN OF CONCRETE STRUCTURES**

Max. Marks: 100

Duration: 3 Hours

**PART A***(Answer all questions; each question carries 3 marks)*

Marks

- |    |   |     |
|----|---|-----|
| 1  | Explain how reinforced concrete beams are classified based on neutral axis depth? | (3) |
| 2  | What are the assumptions made in limit state of collapse in flexure?              | (3) |
| 3  | Define bond stress and explain how proper bond can be maintained in concrete?     | (3) |
| 4  | What are the different types of shear failures in reinforced concrete beams?      | (3) |
| 5  | Differentiate between restrained and unrestrained slabs.                          | (3) |
| 6  | Define the terms: (i) Going (ii) Nosing   | (3) |
| 7  | What is the importance of slenderness ratio in columns?                           | (3) |
| 8  | List out examples of columns with axial loads and biaxial bending.                | (3) |
| 9  | What is a combined footing? Under what circumstances is it used?                  | (3) |
| 10 | Distinguish between ordinary and special moment resistant frames.                 | (3) |

**PART B***(Answer one full question from each module, each question carries 14 marks)***Module -1**

- |    |   |      |
|----|---|------|
| 11 | a) Define characteristic load and characteristic strength.  | (4)  |
|    | b) A singly reinforced beam 400mm wide has an effective depth of 560mm. It is reinforced with 4#18mm diameter HYSD bars of Fe415 grade at an effective cover of 40mm. Classify the section and determine the flexural strength of the beam if M20 grade concrete is used. | (10) |
| 12 | a) What are the different kinds of loads to be taken into account for the design of RCC structures?   | (3)  |
|    | b) Design a singly reinforced rectangular beam of clear span 5.6m simply supported at the ends to carry uniformly distributed live load of 15kN/m. Use M20 concrete and Fe415 grade steel. Assume moderate exposure conditions.   | (11) |

**Module -2**

- 13 a) What are the important factors affecting the shear resistance of a reinforced concrete member without shear reinforcement? (3)
- b) Design a simply supported reinforced concrete beam to support a dead load of 8kN/m and a live load of 20kN/m in addition to its self-weight over a span of 5m. The maximum overall depth is restricted to 500mm. Use M20 concrete and Fe415 grade steel. Assume an effective cover of 50mm. (11)
- 14 a) Under what circumstances should beams be designed for torsion? (2)
- b) Determine the moment of resistance of a T beam with effective width of flange 1100mm, depth of flange 100mm, web width 300mm and effective depth 450mm. The area of steel reinforcement provided is 2500mm<sup>2</sup>. Use M25 concrete and Fe500 grade steel. (12)

**Module -3**

- 15 a) Distinguish between one way and two-way slabs (3)
- b) Design a reinforced concrete floor slab for a room of inside dimensions 4m x 10m and supported on all sides by 40cm thick brick wall. The superimposed load may be taken as 3000N/m<sup>2</sup>. Use M20 concrete and Fe415 grade steel. (11)
- 16 a) What are the various types of staircases based on geometrical configurations? (2)
- b) Design a doglegged stair for the following data: (12)
- Rise = 150mm, Tread = 300mm, No. of steps in a flight = 10, width of the landing = 150mm. Use M20 concrete and Fe415 grade steel. Assume service live load of 5kN/m<sup>2</sup> and stairs to be supported on 230mm thick masonry wall at outer edges of landing parallel to risers.

**Module -4**

- 17 a) Explain the classification of columns based on type of reinforcement. (4)
- b) Design the reinforcement in a spiral column of 400mm diameter subjected to a factored load of 1500kN. The column has an unsupported length of 3.4m and is braced against sideway. Use M25 concrete and Fe 415 steel. (10)
- 18 a) What are the functions of transverse reinforcement in columns? (4)
- b) Design the reinforcement for a rectangular column 300 x 600mm subjected to a factored load of 1400kN and factored moment of 280kNm with respect to the major axis. Use M20 concrete and Fe415 grade steel. (10)

**Module -5**

- 19 a) Design a reinforced concrete footing for a rectangular column 300mm x 500mm (14)  
supporting an ultimate axial load of 1500kN. Safe bearing capacity of the soil is  
180kN/m<sup>2</sup>. Adopt M25 concrete and Fe415 grade steel.
- 20 a) Differentiate between short term and long deflections? (2)
- b) A simply supported beam 300mm x 500mm spans over 6m and is reinforced with (12)  
3#20mm diameter bars on the tension side at an effective depth of 450mm. The  
beam is subjected to a service load of 16kN/m inclusive of self-weight. Using  
M20 concrete and Fe415, calculate crack width at (a) point directly under  
reinforcement bar (b) bottom corner of beam (c) point mid-way between two  
reinforcement bars. Check the beam for limit state of cracking.

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