

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

Course Code: CE301

Course Name: DESIGN OF CONCRETE STRUCTURES I (CE)

Use of IS 456:2000 is permitted

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

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| 1 | a) Explain balanced, under reinforced and over reinforced sections in the context of Limit state design philosophy. | (5) |
| | b) 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. | (10) |
| 2 | a) List various types of shear reinforcements commonly used. Explain each with neat sketches. | (5) |
| | b) Determine the ultimate moment of resistance of a singly reinforced beam of width 300mm and effective depth 450mm reinforced with 3 bars of 25mm diameter. Assume M20 grade concrete and Fe415 grade steel. | (10) |
| 3 | a) What is bond in reinforced concrete? Define development length and derive an expression for development length. | (5) |
| | b) A simply supported beam 230mm x 550mm effective depth, is reinforced with 4 bars of 20mm diameter on the tension face. If the beam is subjected to a vertical shear of 100kN at the critical section, check the adequacy of the section in shear and design the shear reinforcement, if necessary. Use M25 concrete & Fe415 grade steel. | (10) |

PART B

Answer any two full questions, each carries 15 marks.

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| 4 | a) Design and detail a singly reinforced concrete beam of rectangular section subjected to a uniformly distributed live load of 12kN/m over the entire span. Clear span is 5m. The beam is supported on masonry wall, 230mm thick on both sides. Assume moderate exposure conditions. Use M25 grade concrete and Fe 415 grade steel. | (10) |
| | b) What are the situations which demand doubly reinforced section? Derive the expression for ultimate moment of resistance of a doubly reinforced rectangular section. | (5) |
| 5 | a) Sketch typical reinforcement detail in a continuous slab. | (5) |
| | b) Determine the ultimate moment of resistance of a doubly reinforced rectangular beam of width 300mm and overall depth 600mm reinforced with 3-32mm diameter bars on tension side and 2-25mm diameter bars on compression side. | (10) |

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- Assume effective cover on both sides as 50 mm. Use M20 concrete & Fe250 steel
- 6 a) Differentiate between one way slab and two way slab. (5)
b) Design and detail a simply supported slab for a room of interior dimension 8m x 3.5m, subjected to an imposed load of 8kN/m^2 . Thickness of supporting wall is 300mm. Use M20 concrete and Fe415 steel. Assume moderate exposure conditions. (10)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Explain the procedure for flexural crack width estimation in reinforced concrete members as per IS 456. (5)
b) Design and detail a simply supported slab for a room of interior dimension 5m x 4m, subjected to an imposed load of 8kN/m^2 . Corners of the slab are restrained against lift up. Use M20 concrete and Fe415 steel. Assume moderate exposure conditions. Perform all necessary checks except shear check. (15)
- 8 a) Design and detail a dog legged stair for an office building for the following data: (15)
Clear height between floors = 3.2m, Rise = 160 mm, Tread = 270mm, Width of flight = 1.25m, Landing width = 1.25m, Live load = 5kN/m^2 , Load of finish = 1kN/m^2 .
Assume the stair to be supported on 230mm thick masonry walls at the outer edges of landing, parallel to the risers. Assume M20 concrete and Fe415 steel and Mild exposure conditions. Perform all necessary checks except shear check.
b) Explain how deflection serviceability is ensured on beams. (5)
- 9 a) Define slenderness ratio. What are its implications in the design of RC comp members? (5)
b) List the functions of transverse reinforcement in column. Sketch various types of transverse reinforcements commonly used. (5)
c) Design a short square column to carry a factored axial load of 3000kN, using M20 concrete and Fe415 steel. (10)
