

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.*

- |   |  |      |
|---|--|------|
| 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<sup>2</sup>. 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 8 kN/m<sup>2</sup>. 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<sup>2</sup>, Load of finish = 1kN/m<sup>2</sup>.  
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)

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FIFTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

**Course Code: CE301**

**Course Name: DESIGN OF CONCRETE STRUCTURES-I (CE)**

Max. Marks: 100

Duration: 3 Hours

*(Use of IS 456 – 2000 permitted)*

**PART A**

*Answer any two full questions, each carries 15 marks*

Marks

- |   |   |      |
|---|---|------|
| 1 | a) Explain under reinforced, balanced and over reinforced sections.   | (3)  |
|   | b) Find the moment of resistance of a beam section with width 250 mm, effective depth 360 mm and reinforced with 3 Nos 16 mm dia. bars. Use M25 concrete and Fe 415 steel.                            | (12) |
| 2 | a) What are the different types of shear reinforcement in a beam?   | (3)  |
|   | b) Design the stirrups of a beam section of width 200 mm and effective depth 400 mm. The shear force is 100 kN and the percentage of tensile reinforcement is 0.6. Use M20 concrete and Fe 415 steel. | (12) |
| 3 | a) Explain with figure the stress strain relationship of mild steel.  | (5)  |
|   | b) Explain working stress method.   | (5)  |
|   | c) Explain development length.  | (5)  |

**PART B**

*Answer any two full questions, each carries 15 marks*

- |   |   |      |
|---|---|------|
| 4 | a) Draw the longitudinal and cross sections showing the reinforcement detailing for a cantilever beam.  | (5)  |
|   | b) Design a rectangular beam section to resist a bending moment of 30 kNm. Use M20 concrete and Fe 415 steel.   | (10) |
| 5 | a) Design a rectangular beam section to resist a factored bending moment of 575 kNm. The size of the section is limited to 300 mm x 700 mm overall. Use M20 concrete and Fe 415 steel.            | (12) |
|   | b) State the conditions when a doubly reinforced beam is preferred.   | (3)  |
| 6 | a) Design a slab for a room 3 m x 7 m clear in size. Use M20 concrete and Fe 415 steel. The live load is 2 kN/m <sup>2</sup> . Draw top plan and bottom plan to show the reinforcement detailing. | (12) |
|   | b) Differentiate between one-way and two-way slabs.   | (3)  |

**PART C**

*Answer any two full questions, each carries 20 marks*

- 7 Design an RCC slab for a room 3 m x 4 m clear in size. Use M20 concrete and Fe 415 steel. The live load is 2 kN/m<sup>2</sup>. 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) Differentiate between short and long columns. (5)
- b) Design a square column to carry an axial load of 1000 kN. Use M 20 concrete and Fe 415 steel. Draw a longitudinal section and a cross section showing the reinforcement. (15)
- 9 a) Explain the function of lateral tie in a column. (5)
- b) Design a circular column with horizontal ties to carry an axial load of 1000 kN. Use M20 concrete and Fe 415 steel. Draw a longitudinal section and a cross section showing the reinforcement. (15)

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FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

**Course Code: CE301**

**Course Name: DESIGN OF CONCRETE STRUCTURES I (CE)**

Max. Marks: 100

Duration: 3 Hours

**Instructions:**

- 1. Use of IS 456:2000 is permitted**  
**2. Furnish reinforcement detailing of sections designed**

**PART A**

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

Marks

- |   |    |  |      |
|---|----|--|------|
| 1 | a) | Determine the central concentrated load that can be carried by a simply supported singly reinforced beam of 250 mm x 500 mm reinforced with 4 bars of 20mm diameter with an effective cover of 50mm. Effective span of beam is 5.5m. Use M20 concrete and Fe415 steel.   | (9)  |
|   | b) | Differentiate between flexural bond and development bond   | (6)  |
| 2 | a) | Distinguish between under reinforced and over reinforced sections in reinforced concrete beams.  | (5)  |
|   | b) | A 250 mm wide RC beam with 400mm effective depth is reinforced with 3 numbers 20mm diameter bars of Fe 415 grade steel. The beam is provided with 8mm diameter 2 legged vertical stirrups at 150mm/c as shear reinforcement and one of the longitudinal bars is bent up at 45° nearer to support as per IS 456:2000. Determine the design strength of the section in shear if the concrete used is of M20 grade. | (10) |
| 3 | a) | Design the shear reinforcement for a simply supported RC beam of effective span 6m with width 300mm and depth 500mm and carrying a superimposed load of 12kN/m. The beam is reinforced with 4 bars of 20 mm diameter. Use M20 concrete and Fe 415 grade steel. Effective cover to reinforcement 50mm.  | (10) |
|   | b) | What are the advantages and disadvantages of providing large clear cover to reinforcement in flexural members?   | (5)  |

**PART B**

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

- |   |  |      |
|---|--|------|
| 4 | Design a simply supported beam of span 6m subjected to a live load of 5kN/m. Use M20 concrete and Fe415 steel.   | (15) |
| 5 | Design a simply supported RC slab for a room having inside dimensions 3m x 7.5m. Thickness of supporting wall is 230mm. The Live Load on slab is 2 kN/m <sup>2</sup> . Floor finish 1kN/m <sup>2</sup> . Use M20 concrete and Fe 415 steel.  | (15) |
| 6 | a) Design the shear reinforcement required for a reinforced concrete beam 300 mm x 600 mm to carry a factored moment of 120 kNm, a factored shear force of 100 kN and a factored Torsional moment of 60 kNm. Use M25 concrete and Fe415 steel. Effective cover to reinforcement 50 mm. | (9)  |

- b) Draw the reinforcement detailing of (i) cantilever slab (ii) one way continuous slab (6)

**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 Design a reinforced concrete slab 4m x 5m simply supported on all the four sides subjected to a live load of  $4\text{kN/m}^2$ . Use M25 concrete and Fe 415 steel. Assume that the corners of the slab are held down. (20)
- 8 Design a short circular column of effective length 3.3m to carry an axial load of 1200 kN. Provide helical reinforcement as transverse reinforcement. Use M25 concrete and Fe415 steel. (20)
- 9 a) Differentiate between short columns and long columns in RC construction (4)
- b) A reinforced concrete beam of size 250 mm x450 mm is provided with 4 bars of 20mm with an effective cover of 50 mm. Bending moment to be resisted is 50kNm. Determine the crack width at point which is the midpoint of tension edge. Adopt M20 concrete and Fe415 steel. (12)
- c) Briefly explain the load distribution in dog legged stair (4)

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