

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (S,FE) (FT/WP/S3PT) Examinations June 2026 (2019 Scheme)

Course Code: CET303

Course Name: DESIGN OF CONCRETE STRUCTURES

Use of IS 456 and SP 16 is permitted

Max. Marks: 100

Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks)

Marks

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|----|---|---|
| 1 | What are the basic assumptions involved in the analysis at the ultimate limit state of flexure? | 3 |
| 2 | Sketch the stress strain curve of M 20 grade concrete and mark the salient points. | 3 |
| 3 | What is bond in reinforced concrete? | 3 |
| 4 | Define development length and derive an expression for development length. | 3 |
| 5 | Differentiate between one way slab and two-way slab. | 3 |
| 6 | Explain the concept of tread-riser type stairs. | 3 |
| 7 | Sketch various types of transverse reinforcements commonly used in columns. | 3 |
| 8 | Explain the function of lateral tie in a column. | 3 |
| 9 | Explain the importance of ductility in seismic design. | 3 |
| 10 | Explain how limit state of serviceability is ensured in structural members. | 3 |

PART B

(Answer one full question from each module, each question carries 14 marks)

Module -1

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|----|---|---|
| 11 | a) Design a singly reinforced rectangular cantilever beam of span 1 metres to withstand a factored load of 3 kN/m ² . | 9 |
| | b) Find the moment of resistance of a singly reinforced concrete beam of 350 mm width and 400 mm effective depth, reinforced with 3 bars of 16 mm diameter of Fe 415 steel. Take M 25 concrete. | 5 |
| 12 | a) Explain the concept of limit state design? | 5 |
| | b) Design a simply supported singly reinforced rectangular beam of span 3 metres to withstand a factored load of 10 kN/m ² . | 9 |

Module -2

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|----|--|----|
| 13 | a) A simply supported beam 200 mm x 500 mm effective depth, is reinforced with 4 | 10 |
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bars of 20 mm diameter on the tension face. If the beam is subjected to a vertical shear of 300 kN at the critical section, check the adequacy of the section in shear and design the shear reinforcement, if necessary. Use M 25 concrete & Fe 415 grade steel.

- b) Derive the expression for ultimate moment of resistance of a doubly reinforced rectangular section. 4
- 14 a) Design the shear reinforcement for a simply supported RC beam of effective span 5 m with width 250 mm and depth 450 mm and carrying a superimposed load of 12.5 kN/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. 14

Module -3

- 15 a) Design an RCC slab for a room 3 m x 7 m clear in size. Use M 20 concrete and Fe 415 steel. The live load is 5 kN/m². The edges are simply supported and the corners are held down. Draw top plan and bottom plan to show the reinforcement detailing. 10
- b) Draw the reinforcement detailing of (i) cantilever slab (ii) one way continuous slab. 4
- 16 a) Design and detail a dog legged stair [tread-riser type] for an office building for the following data: 14
- Clear height between floors = 3 m, Rise = 160 mm, Tread = 300 mm, Width of flight = 1.2 m, Landing width = 1.2 m, Live load = 5 kN/m², Load of finish = 1kN/m². Assume the stair to be supported on 250 mm thick masonry walls at the outer edges of landing, parallel to the risers. Assume M 25 concrete and Fe 415 steel and severe exposure conditions. Perform all necessary checks except sheer check.

Module -4

- 17 a) Design the reinforcement in a column of size 450 mm 600 mm, subject to an axial load of 3000 kN under service dead and live loads. The column has an unsupported length of 3.0 m and is braced against sideway in both directions. Use M 20 concrete and Fe 415 steel. 14
- 18 a) Using the design aids given in SP : 16, design the longitudinal reinforcement in a rectangular reinforced concrete column of size 300 mm × 600 mm subjected to a factored load of 1400 kN and a factored moment of 280 kNm with respect to the 14

major axis. Assume M 20 concrete and Fe 415 steel.

Module -5

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|----|----|--|----|
| 19 | a) | What are the different types of isolated foundations? | 4 |
| | b) | Explain the process of controlling crack and deflection in flexural members as per Indian standards with the help of an example. | 10 |
| 20 | a) | Explain how limit state of serviceability is ensured in structural members. | 4 |
| | b) | Explain the design principles used in the design of rectangular foundations. | 10 |
