Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (R, S) / S3 (PT) (R, S) Examination December 2023 (2019 Scheme)

Course Code: CET 303
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

1		Distinguish between balanced, over-reinforced and under-reinforced sections in limit state design.	3
2		Sketch the stress strain curve of steel and mark the saliant points.	3
3		Differentiate between flexural bond and development bond.	3
4		What are the different types of shear reinforcement in a beam?	3
5		How does load distribution take place in a two-way slab?	3
6		Explain the effect of restrains in load distribution of continuous slabs.	3
7		List the functions of transverse reinforcement in column.	3
8		Differentiate between short and long columns.	3
9		Explain the procedure of limiting deflection in two-way slabs.	3
10		Explain the procedure for estimation of flexural crack width in reinforced concrete slabs as per Indian standards.	3

PART B

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

Module -1

11	a)	Find the moment of resistance of a singly reinforced concrete beam of 300 mm width and 600 mm effective depth, reinforced with 4 bars of 16 mm diameter of Fe 415 steel. Take M 25 concrete.	5
	b)	Design a singly reinforced rectangular cantilever beam of span 1.5 metres to withstand a factored load of 5 kN/m^2.	9
12	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.	7

b) Design a simply supported singly reinforced rectangular beam of span 3 metres to withstand a factored load of 10 kN/m^2. 7

Module -2

13 a) Define development length and derive an expression for development length. 4

b) A 250 mm wide RC beam with 500 mm depth is reinforced with 4 numbers 16 mm diameter bars of Fe 415 grade steel. Effective cover to reinforcement is 50 mm. The beam is provided with 8 mm diameter 2 legged vertical stirrups at 150 mmc/c as shear reinforcement. M20 concrete is used. Determine the design strength in shear and also its limiting value. 10

14 a) Design the shear reinforcement for a beam with b= 350 mm, d= 550 mm, V_u= 125 kN, f_{ck}= 25 N/mm^2, f_y= 415 N/mm^2. Percentage of steel is 1.67 percent. 10

b) Explain the concept of limit state of collapse in shear and bond. 4

Module -3

15 a) Design an interior panel of a continuous slab system with effective dimensions 4m x 5m subjected to a live load of 3 kN/m^2. Use M20 concrete and Fe 415 steel. Draw top plan and bottom plan to show the reinforcement detailing. 14

16 a) Sketch the reinforcement detailing of a tread-riser type stair. 7

b) Explain the procedure of design of a dog-legged stair case. 7

Module -4

17 a) Design the reinforcement in a spiral column of 400 mm diameter subjected to a factored load of 1500 kN. The column has an unsupported length of 3.4 m and is braced against sideway. Use M 25 concrete and Fe 415 steel. 14

18 a) Design a short square column to carry a factored axial load of 3000 kN, using M 20 concrete and Fe 415 steel. 9

b) Define slenderness ratio. What are its implications in the design of RC compression members? 5

Module -5

19 a) How are isolated foundations classified? 4

b) Explain the process of ensuring limit states of cracking and deflection in flexural members as per Indian standards with the help of an example. 10

20 a) Explain the principles of ductile detailing in the design of earthquake resistant structures. 4

b) Explain the principles used in the design of combined isolated foundations. 10