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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
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 andhence 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 M25concrete & 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)

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 5mx4m, subjected to an imposed load of 8 kN/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 sheer 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 sheer 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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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

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^2. 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^2. 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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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

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 150mmc/c as shear reinforcement and one of the longitudinal bars is bent up at 45^0 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^2. Floor finish $1kN/m^2$. 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 4kN/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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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: CE301

Course Name: DESIGN OF CONCRETE STRUCTURES I

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) A rectangular beam 250mm wide and effective depth 450 mm has 4 bars of 20mm diameter. Find the moment of resistance of the section if M20 concrete and Fe 415 grade steel are used. As per IS 456:2000 find the limiting moment of resistance also. (10)

b) Explain how the longitudinal reinforcement bent up nearer to the supports contribute to the shear resistance of RC beams? (5)

2 a) Explain the terms Characteristic strength and Characteristic load. (5)

b) A 250 mm wide RC beam with 450mm depth is reinforced with 4 numbers 16 mm diameter bars of Fe 415 grade steel. Effective cover to reinforcement is 50mm. The beam is provided with 8 mm diameter 2 legged vertical stirrups at 160 mmc/c as shear reinforcement. M20 concrete is used. Determine the design strength in shear and also its limiting value. (10)

3 a) Design the shear reinforcement for a simply supported RC beam of effective span 5m with width 300mm and effective depth 400mm and carrying a superimposed load of 10 kN/m. The beam is reinforced with 3 bars of 20 mm diameter. Use M20 concrete and Fe 415 grade steel. (10)

b) Why does the code impose minimum and maximum limits with regard to (i) spacing and (ii) percentage area of flexural reinforcement? (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 4 kN/m. Use M20 concrete and Fe415 steel. (15)

5 a) Design a cantilever slab of span 2m to carry imposed load of 2 kN/m^2 over its entire span. Finish load=0.5 kN/m^2. Use M20 concrete and Fe415 steel. The slab is supported by a beam of size 300mmx500mm. (12)

	b)	Is it correct to model the interior beams in a continuous beam supported slab system as T beams to determine their flexural strength at all sections?	(3)
6	a)	Determine the longitudinal reinforcement required for a rectangular beam section with b=300 mm, d=550mm, Mu=100kNm, Tu=45kNm, Vu=80 kN. Adopt M20 concrete and Fe 415 steel.	(8)
	b)	Differentiate between one way slabs and two way slabs.	(4)
	c)	Draw the reinforcement detailing of a simply supported one way slab	(3)

PART C

Answer any two full questions, each carries20 marks.

7		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.	(20)
8		Design a reinforced concrete column to carry an axial load of 1600 kN. Use M20 concrete and Fe415 steel. The column has unsupported length of 3m and is effectively held in position at both the ends, but not restrained against rotation.	(20)
9	a)	Differentiate between short term and long term deflections of RC beams	(6)
	b)	Determine the area of longitudinal steel to be provided in a short column of size 600mm x 600mm subjected to a factored load of 1500 kN. Use M20 concrete and Fe415 steel.	(9)
	c)	Sketch the reinforcement detailing of a tread-riser type stair.	(5)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: CE301

Course Name: DESIGN OF CONCRETE STRUCTURES I

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

1 a) Distinguish between balanced, over-reinforced and under-reinforced sections in limit state design. Which of these should be recommended in design? (5)

b) Find the moment of resistance of a singly reinforced concrete beam of 200 mm width and 400 mm effective depth, reinforced with 4 bars of 16 mm diameter of Fe415 steel. Take M20 concrete. Redesign the beam if necessary. (10)

2 a) With neat sketch explain the stress block parameters used in the design of singly reinforced concrete beam as per limit state method. (5)

b) 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)

3 a) A simply supported beam, 300 mm wide and 600 mm effective depth carries a uniformly distributed load of 74 kN/m including its own weight over an effective span of 6 m. The reinforcement consists of 5 bars of 25 mm diameter. Out of these, two bars can be safely bent up at 1 m distance from the support. Design shear reinforcement for the beam. (10)

b) Define development length and derive an expression for development length. (5)

PART B

Answer any two full questions, each carries 15 marks.

4 a) What are the situations that demand double reinforcement in beams? Compare the stress strain distributions in singly reinforced and doubly reinforced beams. (5)

b) Determine the moment of resistance of beam having width b of 350 mm, depth of 900 mm with a cover of 50 mm. Beam is reinforced with 5 tension reinforcements of 20 mm HYSD bars (Fe 415) and 2 compression reinforcements of 20 mm Fe 415 steel. Grade of concrete is M15. (10)

5 Design a simply supported RCC slab for a roof of a hall 4 m × 10 m (inside dimensions) with 230 mm walls all around. Assume a live load of 4 kN/m^2 and finish 1 kN/m^2. Use M 25 concrete and Fe 415 steel. (15)

6 a) Differentiate between one way slab and two way slab. (5)

b) A T-beam has the following data: width of flange= 750 mm, Breadth of beam= 250 mm, Effective depth= 500 mm, Thickness of flange= 90 mm. Determine the limiting moment of resistance of the beam. Use M20 concrete and Fe415 steel. (10)

PART C

Answer any two full questions, each carries20 marks.

7 a) Design a reinforced concrete slab 6.3 × 4.5 m simply supported on all the four sides. It has to carry a characteristic live load of 10 kN/m^2 in addition to its dead weight. Assume M25 concrete and Fe 415 steel; also assume mild exposure conditions. (15)

b) Explain the procedure for estimation of flexural crack width in reinforced concrete members as per IS456. (5)

8 a) Design and detail a dog-legged stair for a building in which the vertical distance between the floors is 3.6 m. The stair hall measures 2.5 m × 5 m. The live load may be taken as 2500 N/m^2. Assume that stair is supported at outer edges. Use M20 concrete and Fe415 steel. (15)

b) Sketch typical reinforcement detail in tread-riser type stairs. (5)

9 a) Design a circular short column to carry an axial load of 1000 kN using helical reinforcement. Use M20 concrete and Fe 415 steel. (12)

b) How does one (a) check for deflections of two way slabs, and (b) control crack width in two way slabs? (8)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth semester B.Tech degree examinations (S) September 2020

Course Code: CE301

Course Name: DESIGN OF CONCRETE STRUCTURES I

Max. Marks: 100 Duration: 3 Hours

Use of IS 456-2000 is permitted

PART A

Answer any two full questions, each carries 15 marks.

			Marks
1	a)	Why are over reinforced sections not used in practice?	(5)
	b)	A concrete beam has 300 mm breadth and 500 mm effective depth; effective cover 50 mm, reinforced with 3 nos. 20 mm diameter steel bars at tension side. M20 concrete and Fe 415 grade steel are used. Determine the moment of resistance.	(10)
2	a)	What is the purpose of providing development length?	(5)
	b)	Design the shear reinforcement for a beam section of width 200 mm and effective depth 500 mm. The factored shear force is 100 kN and it is reinforced with 3 Nos 16 mm diameter bars on the tension side at the critical section. Use M20 concrete and Fe 415 steel.	(10)
3	a)	Explain characteristic strength of concrete and steel.	(5)
	b)	Explain with figure the stress strain relationship of mild steel.	(5)
	c)	Explain anchorage of reinforcing bars.	(5)

PART B

Answer any two full questions, each carries 15 marks.

4	a)	What are T and L beams?	(5)
	b)	Design a rectangular beam section of width 200 mm to resist a bending moment of 30 kNm. Use M20 concrete and Fe 415 steel.	(10)
5	a)	Differentiate between one way and two way slabs.	(5)
	b)	Design a one way slab with 3.5 m clear span supported on 230 mm thick walls on all four sides. The edges are simply supported. The live load on the slab is 2 kN/m^2. Use M 20 concrete and Fe 415 steel.	(10)
6	a)	When do you require a doubly reinforced beam?	(5)

b) Why do we provide reinforcement in two directions in a one way slab? (5)

c) Draw a typical detailing of a continuous slab. (5)

PART C

Answer any two full questions, each carries20 marks.

7 Design a slab 3 m x 4 m clear in size supported on 300 mm thick walls on all four sides, and corners held down. The live load on slab 3 kN/m^2. Use M20 concrete and Fe415 steel. Draw all the detailing required for the slab. (20)

8 a) Design a square column to carry a factored axial load of 1500 kN. Use M20 concrete and Fe415 steel. Draw a longitudinal section and a cross section showing the reinforcement. (15)

b) What are the purposes of lateral ties in a column? (5)

9 a) Differentiate between long and short columns. (5)

b) Explain limit state of serviceability. (5)

c) Draw a typical detailing for tread riser type stair to show all the reinforcement and mark all reinforcement with assumed values. (10)

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