Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem (Odd) Examination Dec-2019

CE3CO12 RCC Design and Drawing

Programme: B.Tech. Branch/Specialisation: CE

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated.Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. Characteristic strength of steel reinforcement is **1**
(a) Safe permissible strength (b) Yield strength
(c) Ultimate strength (d) 0.87× yield strength

ii. According to IS code minimum Grade of concrete to be used for RCC work is **1**
(a) M10 (b) M15 (c) M20 (d) M25

iii. Modular ratio is commonly used in **1**
(a) Working stress method
(b) Limit State Method
(c) Ultimate Strength Method
(d) WSM and LSM

iv. Spacing of stirrups should not exceed **1**
(a) 0.75d or 300 mm whichever is less
(b) 0.75d or 450 mm whichever is less
(c) 3d or 300 mm whichever is less
(d) 3d or450 mm whichever is less

v. Tc depends on **1**
(a) % of main reinforcement and grade of steel.
(b) % of main reinforcement and grade of concrete.
(c) % of shear reinforcement and grade of steel.
(d) % of shear reinforcement and grade of concrete.

vi. For designing a two way slab the essential conditions are **1**
(a) Length to width ratio greater than 2 and all-round support.
(b) Length to width ratio less than 2 and all-round support.
(c) Length to width ratio greater than 2.
(d) Length to width ratio less than 2.

P.T.O.

vii. In column lateral ties are provided **1**
(a) To carry compression
(b) To carry tension
(c) To carry shear
(d) To keep main reinforcement in position.

viii. In column design minimum eccentricity criterion means **1**
(a) Load is applied at calculated minimum eccentricity
(b) Load is assumed to act at minimum eccentricity.
(c) Load is applied in 2 parts one concentric and one eccentric
(d) None of these

ix. Depth of footings should not be less than **1**
(a) 300 mm (b) 250mm (c) 150mm (d) 100mm

x. For two-way shear check max. Allowable shear stress is **1**
(a) Tc (b) ktc (c) 0.25√fck (d) 0 0.57√fck

Q.2 i. Define characteristics strength and characteristic load. **4**

ii. Sketch stress block and strain diagram with complete details, recommended by IS Code for LSM method. **6**

OR iii. Derive formula for Xumax and Xu actual and explain under and over reinforced sections. **6**

Q.3 i. Enumerate the conditions under which a beam is designed doubly reinforced. **2**

ii. Design a simply supported beam (including shear) subjected to a UDL of 30 kilometre per metre inclusive of self weight over a span of 6 metres. Sketch reinforcement details. Use M20 concrete and a Fe415 Steel. **8**

OR iii. An RCC beam is 200mm×550mm (overall) is provided with 5#16 bars in tension and 2#12 bars in compression at 50 mm effective cover. Find the UDL that the beam can carry safely. **8**

Q.4 i. Enumerate various serviceability limits and explain how these achieved. **3**

ii. Design a one-way slab for 3.5 m effective span for a residential building. Apply check for shear. Assume M20 concrete and Fe415 steel. Sketch reinforcement details. **7**

OR iii. Design a two-way slab for 4×5m effective size with all the edges continuous. Assume residential building loads, M20 concrete and Fe 415 steel. Sketch reinforcement details. **7**

Q.5 i. State assumptions in limit state of compression. **3**

ii. Design an RCC column to carry an axial load of 1600 kN. It is 4 metre long effectively held in position and Restaurant against rotation at both ends. Use M20 concrete and Fe415steel.Sketch reinforcement details. **7**

OR iii. Design a circular column of diameter 400 mm subjected to a load of 1200kN. The column is 3 metre long and it is effectively held in position at both ends but not restrained against rotation. Use M 25 concrete Fe 415 steel. **7**

Q.6 i. Describe location of one way shear and two way shear for a square footing, as per I.S. Code provision with neat sketches. **2**

ii. Design rectangular footing of uniform thickness for an axially loaded column of size 300 mm ×600 mm, load on column is 1150 kN. Safe bearing capacity of the soil is 200 kN/m2, use M20 concrete and a Fe415 steel. Sketch reinforcement details **8**

OR iii. Design a square sloped footing for a column of size 400 ×400 mm, load on column is 1400 kN. Assume safe bearing capacity of soil as 150kN/m2, concrete M20 and steel Fe415. Sketch reinforcement details. **8**

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Marking Scheme
CE3CO12 RCC Design and Drawing

Q.1	i.	Characteristic strength of steel reinforcement is (b) Yield strength		**1**
	ii.	According to IS code minimum Grade of concrete to be used for RCC work is (c) M20		**1**
	iii.	Modular ratio is commonly used in (a) Working stress method		**1**
	iv.	Spacing of stirrups should not exceed (a) 0.75d or 300 mm whichever is less		**1**
	v.	Tc depends on (b) % of main reinforcement and grade of concrete.		**1**
	vi.	For designing a two way slab the essential conditions are (b) Length to width ratio less than 2 and all-round support.		**1**
	vii.	In column lateral ties are provided (d) To keep main reinforcement in position.		**1**
	viii.	In column design minimum eccentricity criterion means (b) Load is assumed to act at minimum eccentricity.		**1**
	ix.	Depth of footings should not be less than (c) 150mm		**1**
	x.	For two-way shear check max. Allowable shear stress is (c) 0.25√fck		**1**
Q.2	i.	Definition of characteristics strength	2 marks	**4**
		Definition of characteristic load.	2 marks	
	ii.	Stress block with complete details	3 marks	**6**
		Strain diagram with complete details	3 marks	
OR	iii.	Formula for Xu max	2 marks	**6**
		Formula for Xu actual	2 marks	
		Explanation under reinforced sections	1 mark	
		Explanation over reinforced sections	1 mark	
Q.3	i.	Conditions under which a beam is designed doubly reinforced.		**2**
		1 mark for each condition	(1 mark * 2)	
	ii.	Design a simply supported beam (including shear)		**8**
		Bending Moment and S.F.	2 marks	
		Depth	1 mark	
		Area of Steel	2 marks	
		Shear	1 mark	
		Sketch	2 marks	
OR	iii.	Find the UDL that the beam can carry safely.		**8**
		Xu compare	2 marks	
		MU_1 and MU_2	3 marks	
		W (Safe load)	3 marks	
Q.4	i.	Serviceability limits 1.5 marks for each limit	(1.5 marks*2)	**3**
	ii.	Design a one-way slab		**7**
		Load calculation	1 mark	
		Bending Moment and S.F.	1 mark	
		Depth	1 mark	
		Area of Steel	1 mark	
		Distribution Steel	1 mark	
		Shear check	1 mark	
		Sketch	1 mark	
OR	iii.	Design a two-way slab and sketch reinforcement details.		**7**
		Load calculation	1 mark	
		Bending Moment and S.F.	1 mark	
		Depth	1 mark	
		Area of Steel	1 mark	
		Distribution Steel	1 mark	
		Shear check	1 mark	
		Sketch	1 mark	
Q.5	i.	Assumptions in limit state of compression.		**3**
		1 mark for each assumption	(1 mark *3)	
	ii.	Design an RCC column and sketch reinforcement details.		**7**
		Effective length	0.5 mark	
		Dimension Size	1.5 marks	
		Check slenderness ratio	1 mark	
		Minimum Eccentricity	1 mark	
		Longitundal R/f	1 mark	
		Lateral Ties	1 mark	
		Sketch	1 mark	
OR	iii.	Design a circular column		**7**
		Effective length	0.5 mark	
		Dimension Size	1.5 marks	
		Check slenderness ratio	1 mark	
		Minimum Eccentricity	1 mark	
		Longitundal R/f	1 mark	
		Lateral Ties	1 mark	
		Sketch	1 mark	

Q.6	i.	Location of one way shear and two way shear		**2**
		1 mark for each location with sketches	(1 mark *2)	
	ii.	Design rectangular footing and sketch reinforcement details		**8**
		Size/dimension	1 mark	
		One way shear	1.5 marks	
		Two way shear	1.5 marks	
		Bending Moment	1 mark	
		Area of Steel	1 mark	
		Sketches	2 marks	
OR	iii.	Design a square sloped footing and sketch reinforcement details.		**8**
		Size/dimension	1 mark	
		One way shear	1.5 marks	
		Two way shear	1.5 marks	
		Bending Moment	1 mark	
		Area of Steel	1 mark	
		Sketches	2 marks	

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