MAY 2017

(REVISED COURSE) QP Code : 16461

(3 Hours) [Total Marks : 80]

N.B.: (1) Question No.1 is Compulsory.
(2) Answer any three from the remaining.
(3) Each full question carries equal marks.
(4) Assume suitable data if needed & state it clearly.
(5) Required tables from IS 456:2000 are given at the end.

1. (a) Distinguish between One Way Slab & Two Way Slab. 4
(b) A beam (300 mm × 600 mm) is reinforced with 2 bars of 25 mm diameter. Find the Ultimate Moment of Resistance. Use Ultimate Load Theory. Use M20/Fe415. Assume the effective cover = 37.5 mm. 4
(c) Discuss characteristic load & characteristic strength of materials. 4
(d) Explain the Types of Shear Reinforcement. Draw neat sketches. 4
(e) Write a note on design of columns subjected to Compression & Uniaxial Bending. 4

2. (a) A rectangular beam, having 200 mm width & 400 mm effective depth, is reinforced with 3 bars of 16 mm diameter Fe415 steel. Find the ultimate UDL (factored or design UDL) which the beam can safely carry over a span of 5m. Use M20 concrete 9
(b) A simply supported rectangular beam of 8 m clear span carries a factored load of 45 kN/m over the entire span. The beam is 230 mm wide & effective depth is 500 mm. It is reinforced with 6 bars of 20 mm diameter bars. Design the shear reinforcement using vertical stirrups only. The ends of the beam are not confined by the compressive reaction. Use M20 concrete & Fe415 steel. Sketch the details. 9
(c) In a RCC member, the best way to ensure adequate bond is to: 2
(i) Provide minimum number of large dia. bars (ii) Provide large number of smaller dia. Bars
(iii) Increase the cover for reinforcement (iv) Provide additional stirrups

3. (a) A rectangular beam of size 230 mm width & 500 mm effective depth is subjected to a factored moment of 200 kNm. Find the reinforcement for flexure. Use M20 concrete & Fe415 steel. 9
(b) Find the Limiting Moment of Resistance & Limiting Area of Steel for a T-beam, having flange width of 1600 mm, effective depth of 350 mm & flange thickness of 100 mm. The web width is 250 mm. Use M20 concrete & Fe500 steel 9
(c) In Limit State Design of RCC, deflection is computed by using : 2
(i) Initial tangent modulus (ii) Secant modulus
(iii) Tangent modulus (iv) Short term & long term values of Young's modulus

muquestionpapers.com

4. (a) Design a short square column to carry a safe axial load of 1600 kN. It is 4 m long, effectively held in position & restrained against rotation at both ends (effective length 0.65L). Use M20 concrete & Fe415 steel. Show the steel details on sketches. Carry out the check for minimum eccentricity. 9

(b) A simply supported one-way slab of a public building has a clear span of 2.5 m & is supported on beams 230 mm wide. Design the slab if Live Load is 5 kN/m. Use M20 concrete & Fe415 steel. Show reinforcement details. Carry out check for shear. Other checks are not needed. 9

(c) In Limit State Design of Concrete Structures, strain distribution is assumed to be: 2
(i) Linear (ii) Non-linear (iii) Parabolic (iv) Parabolic & rectangular

5. (a) A rectangular beam section is (300 mm × 600 mm) overall. Concrete is M20 & steel is Fe415. Factored moment is 116 kNm, factored torsion is 46 KNm & factored shear is 95 kN. Find the reinforcement required. Sketch the details. 9

(b) Design a slab for a room of a building, whose clear dimensions are (4 m × 5 m). The slab is supported on walls of width 300 mm. The Live Load = 4 kN/m^2 & Floor Finish = 1 kN/m^2. Use M20 Concrete & Fe415 steel. Corners of the slab are not held down. Sketch reinforcement details. Serviceability checks are not needed. 9

(c) Limit State of Serviceability for deflection including the effects due to creep, shrinkage & temperature occurring alter erection of partitions & application of finishes as applicable to floors & roofs, is restricted to. 2
(i) Span/150 (ii) Span/200 (iii) Span/250 (iv) Span/350

6. (a) Design a square footing of uniform thickness for an axially loaded column of (450 mm × 450 mm) size. The SBC of soil = 190 kN/m^2 . Column carries a load of 850 kN. Use M20 concrete & Fe415 steel. Sketch the steel details. 16

(b) Draw the laboratory Stress-Strain curves & Idealized Stress-Strain curves (as per IS456:2000) for the Concrete & the steel. Explain the same. 4

Table : Design Shear Strength of Concrete

100A/bd	≤ 0.15	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.5 & above
τ_c (MPa) for M20 concrete	0.28	0.36	0.48	0.56	0.62	0.67	0.72	0.75	0.79	0.81	0.82

Table : Values of (k) for Solid Slabs

Overall Slab Depth (mm)	≥ 300	275	250	225	200	175	≤150
(k)	1.00	1.05	1.10	1.15	1.20	1.25	1.30

Table : Stress in compression steel, fsc(MPa) in Doubly Reinforced Beams

fy(MPa)	(d'/d)			
	0.05	0.1	0.15	0.20
415	355	353	342	329

Table : Bending Moment Coefficients for Slabs Spanning in 2 Directions at Right Angles, Simply Supported on Four Sides

Ly/Lx	1.2	1.3	1.4
αx	0.084	0.093	0.099
αy	0.059	0.055	0.051

muquestionpapers.com