C **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 51U02

M.E. DEGREE EXAMINATION, APRIL 2019

First Semester

Structural Engineering

15PSE102 - CONCRETE STRUCTURES

(Regulation 2015)

(IS456-2000, IS875 (1-5) 1987, SP (16) - 1980 and IS13920- 1993 are permitted)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART - A (5 x 1= 5 Marks)

1. The ratio of long span to short span exceeding 2 is called CO1- R

   (a) Flat slab (b) Two way slab (c) One way slab (d) None of these

2. The unsupported length to least lateral dimension ratio of column with end restaints is restricted to CO2 -R

   (a) 30 (b) 50 (c) 60 (d) 20

3. Underthe Direct Design Method in the interior span the proportion of negative design moment to total design moment is CO3- R

   (a) 0.35 (b) 0.45 (c) 0.65 (d) 0.55

4. The maximum value of compressive stress in concrete is reached at a strain of about CO4 -R

   (a) 0.002 (b) 0.0035 (c) 0.003 (d) 0.02

5. In ductile detailing, when a column terminates into a footing, special confining reinforcement shall extend into the footing at least CO5- R

   (a) 200 mm (b) 2d (c) L_d (d) 300 mm

PART – B (5 x 3= 15 Marks)

6. How will you calculate deflection due to creep as per IS 456? CO1-U

7. What is the function of shear wall and what are its types? CO2-U

8. Distinguish drops and column head. CO3-U

9. Define plastic hinge. CO4-U

10. Explain the strong-column-weak-beam design concept. CO5-U

PART – C (5 x 16= 80 Marks)

11. (a) Determine the area of steel required for a beam b = 300 mm, d = 675 mm for carrying a factored moment of 185 kN m. Assume f_y = 415 N/mm^2 and f_{ck} = 20 N/mm^2. Solve the problem by
(a) direct computation and
(b) using SP 16. CO1- App (16)

Or

(b) In a flanged beam, b_f = 960 mm, b_w = 200 mm, D_f = 125 mm, d = 315 mm, and factored moment = 240 kN m. Check the capacity of the beam to carry the load and if it is safe, design the steel required. Assume Fe 415 steel and grade 20 concrete. CO1- App (16)

12. (a) Design R.C braced column 400x500mm with L_o= 9m, L_e = 6.75m and has 70kN-m and 10 kN-m as ultimate moments $My_{(top)}$ and $My_{(bottom)}$ respectively. The axial ultimate load is 2000 kN. If the column is bent in double curvature, determine the design moments (YY is the minor axis). Adopt M_{40} and Fe_{415} grades. CO2- Ana (16)

Or

(b) Design a corbel to carry a factored load of 500 kN at a distance of 200 mm from the face of a 300 x 300 mm column. Assume M30 concrete and Fe415 steel. CO2- App (16)

13. (a) A flat plate with 7.5 m x 6 m panels on 500 x 500 mm columns has a slab thickness of 185 mm, designed for a total characteristic load (DL + LL) of 9.3 kN/m2. Check the safety of the slab in shear if grade 25 concrete and grade 415 steel are used for its construction. How can we increase the shear capacity of the slab? CO3-App (16)

Or

(b) Design a simply supported rectangular slab of size 4m x 3m using yield line theory. The slab is subjected to a live load of 3.5 kN/m^2 and floor finish of 1 kN/m^2. Use M20 grade of concrete and Fe 415 grade of steel. CO3-App (16)

14. (a) Determine the salient points on the stress – strain curve of concrete in bending of a unconfined concrete member if cylinder strength of concrete used f_c' is 25 N/mm^2. If such a concrete is confined in a section of breadth 300mm, total depth 500mm and clear cover of 50mm with 10mm (78 mm^2) stirrups at 100mm centers, determine the stress – strain curve for inelastic analysis of the structures. Use the relation $f_c' = 0.8\ f_{ck}$. CO4 -App (16)

Or

(b) A reinforced concrete slab is 150mm thick with 20mm cover to center of steel. If the positive steel reinforcement is 500mm^2/m. Determine the approximate moment curvature. Determine the ductility factor assuming M30 concrete and Fe250 steel for reinforcements. CO4 -App (16)

15. (a) In a multi-storeyed RC frame building located at Chennai, a typical column of 3.4m clear height carries an axial load of 3500 kN and a bending moment of 780kN-m under gravity and seismic load conditions. Design the column section with adequate ductility. Assume M25 grade of concrete and Fe415 grade of steel. CO5-App (16)

Or

(b) Explain with diagrams the main design requirements of ductile shear wall in earthquake resistant design. CO5-U (16)