Reg. No. : | | | | | | | | | | |

Question Paper Code: 12062

M.E. DEGREE EXAMINATION, DECEMBER 2013.

First Semester

Structural Engineering

01PSE101 - ADVANCED REINFORCED CONCRETE DESIGN

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

(Use of IS 456, IS 13920, IS 1893 (Part-1) and SP 16 are permitted
Assume M20 grade concrete and Fe415 grade steel unless otherwise stated.
Missing data if any, maybe suitably assumed.)

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. List the factors affecting deflection.
2. What is the limit of crack width as per IS456?
3. Define Slender Column.
4. State the difference between ordinary RC wall and shear wall.
5. Differentiate between flat slab and flat plate.
6. What do you mean by “Spandrel Beam”?
7. Give the equation to calculate the curvature in reinforced concrete beams.
8. List any two assumptions made in Baker’s analysis.
9. What are the factors affecting the quality of concrete?
10. Define Ductility.

PART - B (5 x 14 = 70 Marks)

11. (a) A reinforced concrete beam 200 mm wide by 450 mm overall depth is reinforced with 3 bars of 16 mm diameter at an effective depth of 420 mm. Two hanger bars of 12 mm diameter are provided at the compression face. The effective span of the beam is 5 m. The beam supports a service live load of 10 kN/m.
If f_{ck} = 20 N/mm^2 and f_y = 415 N/mm^2, compute.
a) The short term deflection
b) Long term deflection according to IS 456. (14)

Or

(b) Determine the maximum probable crack width for a doubly reinforced beam with the following details:
Overall depth = 400 mm; Breadth of beam = 250 mm;
Area of tension reinforcement = 1848 mm^2;
Area of compression reinforcement = 942 mm^2;
Bending Moment due to Dead Load and Live Load at midspan = 124 kNm;
Grade of concrete = M25; Grade of steel = Fe415. (14)

12. (a) Design a reinforced concrete wall of 5 m height which is restrained in position and direction at both ends and has to carry at its top a factored load of 600 kN and factored moment of 25 kNm at right angles to the plane of the wall. (14)

Or

(b) Design a corbel to carry a factored load of 500 kN at a distance of 200 mm from the face of 300 mm x 300 mm column. Assume that grade of concrete used is M30. (14)

13. (a) Design the interior panel of a flat slab for a ware house to suit the following data:
Size of the ware house is 24 m by 24 m divided into panels of 6 m by 6 m; Live Load = 5 kN/m^2; Grade of concrete = M20; Grade of Steel = Fe415. (14)

Or

(b) A two-way RCC slab is rectangular having a size 4 m by 5 m with two longer edges fixed in position and two shorter edges are simply supported. Derive the relation between moment capacity of slab and ultimate load and hence design the slab for a working live load of 3 kN/m^2 by yield line theory. Assume μ = 0.8. Adopt M 20 grade concrete and Fe415 bars. (14)

14. (a) A T-beam is continuous over two spans of 8 m each and it carries uniformly distributed factored load of 75 kN/m. Assuming f_{ck} = 25 N/mm^2 and f_y = 415 N/mm^2 (with bilinear stress-strain curve) check whether we can reduce the maximum moment by 30% and redistribute to the spans. Width of flange = 1000 mm, width of web = 300 mm; thickness of slab = 150 mm; overall depth = 820 mm and effective depth = 770mm. (14)

Or

(b) A four span continuous T beam ABCDE of 4 m in each span is subjected to a characteristic load of 40 kN/m including its weight. Design the beam so that it fails by plastic failure at the supports at an ultimate load with a load factor 1.5. (14)

15. a) (i) Discuss the effect of fire on different types of structural members. (7)

(ii) How will you evaluate the quality of concrete at construction sites? (7)

Or

(b) (i) List the factors that increase ductility. (4)

(ii) Discuss about the ductile detailing in beams and columns. (10)

PART - C (1 x 10 = 10 Marks)

16. (a) Explain the steps involved in the design of joints. (10)

Or

(b) Discuss about the strut and tie method of analysis of corbels and deep beams. (10)