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

Question Paper Code : 11284

M.E./M.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

First Semester

Structural Engineering

ST 5101 — ADVANCED CONCRETE STRUCTURES

(Regulation 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the types of cracks.
2. What is the % of minimum reinforcement in slabs and columns?
3. Define deep beam.
4. What is the minimum eccentricity in RC walls?
5. State the types of flat slab.
6. What are all the characters of the yield line?
7. State the assumptions in the inelastic theory.
8. State the advantages of ductility.
9. Define ductility.
10. Where is special confining reinforcement provided in the beam column junction?

PART B — (5 × 13 = 65 marks)

11. (a) A reinforced concrete cantilever beam of 4 m span has rectangular cross section of size 300 mm × 600 mm overall depth. It is reinforced with 6 bars of 20 mm dia. on tension side. It is reinforced with 2 bars of 20 mm dia. and one bar of 12 mm dia. on compression side. Compute the total deflection at the free end when it is subjected to an UDL of 25 kN/m at service state. 60% of the load is permanent in nature. Use M20 concrete and Fe415 steel.

Or

(b) A reinforced concrete beam of width 450 mm and overall depth of 750 mm has effective cover of 40 mm. The tension reinforcement is 3 bars of 40 mm dia. Calculate the crack width when the section is subjected to a BM of 490 kNm at the following points.

(i) at a point on the side of the beam 250 mm below the NA

(ii) at a point midway between bars on the tension face

(iii) at the bottom corners

(iv) at the tension face directly under the bars.

Use M25 grade concrete and Fe415 grade steel.

12. (a) Design a corbel to carry a factored load of 500 kN at a distance of 200 mm from the face of a 300 mm × 300 mm column. Use M30 grade concrete and Fe415 steel.

Or

(b) An RC grid floor is to be designed to cover an area of 12 m × 16 m, the spacing of ribs in mutually perpendicular direction being 2 m c/c. Live load is 1.5 kN/m². Use M20 concrete and Fe415 steel.

13. (a) Design an interior panel of flat slab of size 6 m × 6 m. The panel is supported by 300 mm dia columns. Drops may be provided. Live load is 5 kN/m² and floor finish is 0.75 kN/m². Use M20 grade concrete and Fe415 steel.

Or

(b) Using yield line theory, design an orthotropic rectangular slab of size 4 m × 6 m. The slab is subjected to a live load of 4 kN/m², $\mu = 0.5$. Use M20 grade concrete and Fe415 steel.

14. (a) Explain the steps involved in the Baker's method of analysis.

Or

(b) A RC beam of size 300 mm × 600 mm overall depth has effective cover 60 mm. The beam is reinforced with 3 nos. of 20 mm dia in compression zone and 6 nos. of 20 mm dia in tension zone. Find ductility in case of (i) M20 grade concrete and Fe250 steel and (ii) M20 grade concrete and Fe415 steel.

15. (a) Design a beam of effective span 4.8 m for ductility. Width of the beam is 300 mm. Overall depth of the beam is 600 mm. The beam is subjected to factored shear force of 133 kN, factored sagging moment of 142 kNm and factored hogging moment of 225 kNm. Use M20 concrete and Fe415 steel.

Or

(b) Design a column of effective length 3 m for the following data. Size of the column = 300 mm × 500 mm. Factored axial force = 323 kN. Factored shear force = 80 kN. Factored bending moment = 143 kNm. Use M20 concrete and Fe415 steel.

PART C — (1 × 15 = 15 marks)

16. (a) Design the longitudinal reinforcement for a braced column 300 mm × 400 mm subjected to a factored axial load of 1500 kN and factored moments of 60 kNm and 40 kNm with respect to major and minor axis respectively at top. Assume that the column is bent in double curvature with moment at bottom is equal to 50% of moment at top. Assume unsupported length is 7 m and length ratio is 0.85. Use M30 concrete and Fe415 steel.

Or

(b) With an example explain the application of moment-notation curves in the inelastic design of reinforced concrete beams.

———————