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

Question Paper Code : X 86196

M.E./M.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
First Semester
Structural Engineering
ST 5101 – ADVANCED CONCRETE STRUCTURES
(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Is 456 and SP 16 are permitted

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. Mention the codal provisions to control deflection and crack width of RC slabs.
2. Mention the use of partial safety factors.
3. What is a slender column ?
4. Why side face reinforcements are extremely important in deep beams ?
5. What are the forces to be considered in the design of spandrel beams ?
6. Differentiate between yield line and strip line.
7. State the assumptions made in Baker's method of limit analysis and design.
8. Why moment redistribution is limited when percentage of steel is higher ?
9. Discuss about average cover and ductility factor.
10. What is meant by special confining reinforcement in columns of ductile frames ?

PART – B **(5×13=65 Marks)**

11. a) A rectangular simply supported beam of span 5 m in 300 × 600 mm in cross section and is reinforced with 3 bars of 20 mm on tension side at an effective cover of 50 mm. Determine the shear reinforcement due to a limit state load of 175 kN/m including self-weight and live load. Assume grade of concrete M20 and grade of steel as Fe 500.

(OR)

b) An unbraced column 300 mm × 400 mm in section is unbraced in both the principal directions. The column ends are fixed and the column has supported length of 4 m. The column carries an ultimate axial load of 800 kN and ultimate moments of 80 kNm and 40 kNm about the major axis bisecting the depth at its ends. Assuming M 20 concrete, Fe 415 steel and an effective cover of 60 mm, determine the area of longitudinal reinforcement.

12. a) A plain concrete wall of 4 m high, 6 m long and 200 mm thick is restrained against rotation at its base and unrestrained at the ends. Examine the load the wall can carry. Assume f_{ck} = 25 N/mm^2, f_y = 500 N/mm^2. Design the wall if it has to carry a factored load of 600 kN/m.

(OR)

b) Design a corbel to support a gantry girder reaction of 350 kN at service load condition acting at a distance of 225 mm from the face of a 350 mm × 350 mm column. Adopt M25 concrete and Fe 415 steel. Also sketch the reinforcement details.

13. a) A flat slab floor system consisting of seven panels in each direction supports live load and finish load of 4 kN/m^2 and 1.25 kN/m^2 respectively. The supporting columns are 550 mm diameter with storey height of 3m. Using the provisions of IS 456, design an interior panel of size 7.5 m × 6 m with appropriate column heads and drops. Adopt M20 concrete and Fe 415 steel.

(OR)

b) A square interior panel of an intermediate floor is of effective dimension 5 m× 5 m. The live load on the floor is 2.5 kN/m^2. Finishes is 1 kN/m^2. Analyze the slab using yield line approach and design the slab. Use M20 concrete and Fe415 steel.

14. a) Explain the step by step procedure for the design of RC flexural members by Baker's method of limit analysis and design.

(OR)

b) i) Explain in detail with sketches the moment-curvature relationship for under reinforced, balanced and over reinforced sections. **6)**

ii) Explain the conditions given in IS 456 for moment redistribution. **(7)**

15. a) Discuss the behaviour of RC members under sustained high temperature and the methods to improve the performance.

(OR)

b) Enumerate the ductile detailing requirements of beams, columns and frames as per IS : 13920 code procedures.

PART – C **(1×15=15 Marks)**

16. a) Design a simply supported slab of size 4 m by 3 m using yield line theory. The slab is subjected to a live load of 3.5 kN/m^2. And floor finish of 1.5 kN/m^2. Use M20 and Fe 415 using Hillerborg's pattern.

(OR)

b) Design a deep beam 300 mm wide and 4000 mm deep, simply supported over a clear span of 6m. The beam carries a live load of 160 kN/m at the service state and is supported on walls of 600 mm thick at each end. Use M20 concrete and Fe415 steel. Also sketch the reinforcement details of the deep beam.

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