194 Register No.:

October 2018

Time – Three hours
(Maximum Marks: 75)

[N.B: (1) Q.No. 8 in PART – A and Q.No. 16 in PART – B are compulsory. Answer any FOUR questions from the remaining in each PART – A and PART – B

(2) Answer division (a) or division (b) of each question in PART – C.

(3) Each question carries 2 marks in PART – A, 3 marks in Part – B and 10 marks in PART – C.

(4) Use of IS-456:2000, Structural engineer's hand book, IS-800:2007 Steel Tables are permitted]

PART – A

1. Differentiate between singly reinforced beam and doubly reinforced beam.
2. Define one way slab and two way slab.
3. What is the code specification of minimum shear reinforcement?
4. List any four requirements of stair.
5. Mention the different classification of column based on slenderness ratio.
6. What do you mean by development length of reinforcement bar?
7. Define effective length and slenderness ratio of steel compression members.
8. Define limit state and write their design requirements.

PART – B

9. Mention the purposes of providing reinforcement in RCC.
10. Explain middle strip and edge strip in two way slab.
11. Differentiate main and secondary reinforcement in one way slab.
12. Sketch the various forms of shear reinforcement and mention their purpose.
13. What is torsional reinforcement and when shall it be provided?
14. State the functions of column footing and mention its types.
15. Explain the classification of steel beams.
16. State the assumptions of limit state of collapse.

PART – C

17. (a) A simply supported rectangular beam of effective span 6.40m carries an UDL of 18 kN/m(inclusive self weight) throughout its length. Design the mid span section of the beam for the limit state of collapse in flexure. The breadth of the beam has to be 230mm.

(Or)

(b) A beam of rectangular section is 230mm wide and 600mm overall depth and is provided with 4 bars of 16mm diameter as tensile steel with an effective cover of 40mm. Find the ultimate moment of resistance of the section use M20 concrete and Fe415 steel. Find also the superimposed load carried by the beam with effective span 5m.

18. (a) Design a one way slab, simply supported for a clear span of 3.8m. The slab is supported by 200mm wide brick walls. Imposed load on the slab is 2.5 kN/m^2. Weight of the floor finish will be 1.5kN/m^2. Use M20 concrete and Fe415 grade steel. Check for deflection only.

(Or)

(b) Design a simply supported roof slab for a reading room of clear size 5m×3.6m, using M20 grade concrete and Fe415 grade steel. No access is provided to the roof. The width of masonry wall around is 230mm. Weight of weathering course is 1.5kN/m^2.

19. (a) The support section of a cantilever beam of effective size 300mm × 600mm is subjected to a design shear force of 270 kN. The section has 5 numbers of 25mm diameter bars in its tension zone. M25 grade concrete and Fe415 grade steel are used. Design suitable vertical stirrups for the section.

(Or)

(b) Briefly explain the following with respect to staircases of the building. (i)Effective breadth of flight slab (ii)Distribution of loads on flights (iii)Planning of staircase for a residential building.

20. (a) Design a rectangular R.C column of side ratio 1.5, to carry as axial load of 900kN using M25 grade concrete and Fe500 grade steel. Assume the column as a short column, the area of longitudinal reinforcement shall not exceed 2% of the gross area.

(Or)

(b) A square R.C. column of 425mm × 425mm size carries an axial load of 1800kN. The safe bearing capacity of soil is 200kN/m^2. Design a square R.C. footing with uniform thickness for the column for flexure only. Use M20 grade concrete and Fe415 grade steel. Check for shear is not necessary.

21. (a) Design a simple beam to carry an imposed load of 28kN/m on an effective span of 6m. Take fy = 300 Mpa and E=2.1×10^6 Mpa.

(Or)

(b) Design a steel column to carry an axial compressive load of 1300kN using a single rolled *I*-section of yield stress 300 Mpa. The height of the columns is 5.6m. It has both ends restrained against rotation and held in position.
