207 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) IS456-2000, IS800-2007,Steel table and structural engg. Hand book approved by the board are permitted

(5) Suitable data may be assumed wherever necessary*]*

PART – A

1. Define limit state.
2. Write down the span depth ratio for cantilever beam and simply supported beam.
3. Mention the different forms of shear reinforcement provided for beams.
4. Define tread and rise of a stair.
5. What is the purpose of providing transverse reinforcement for a column?
6. What is the main function of column footings?
7. Mention the different types of welds.
8. Define shape factor.

PART – B

9. Differentiate under reinforced and over reinforced sections.
10. Write the code provisions for beam regarding.
    a) Minimum area tension reinforcement.
    b) Maximum area tension reinforcement.
    c) Maximum area compression reinforcement.
11. When torsional reinforcement is provided in two way slabs? Explain the code provisions regarding torsion reinforcement in slab.

[Turn over.....

12. What is meant by isolated footing and combined footing?

13. How will you find out the effective span of a continuous beam?

14. Classify steel beams.

15. Mention the different rolled steel I sections.

16. Write a note on effective width of flange.

PART – C

17. (a) A simply supported rectangular beam of size 250mm X 550mm overall size is reinforced with 4 nos. of 20mm diameter bars at a clear cover of 35mm. If the effective span of the beam is 5m, find the load carrying capacity of the beam excluding its self weight using limit state. Use M20 and Fe415 steel. Also find the working load.

(Or)

(b) Design a doubly reinforced rectangular simply supported beam at its both ends to carry a live load of 30kN/m and dead load of 18kN/m over a clear span of 6.2m. The width and overall depth of beam are kept as 360mm and 600mm respectively. Assume 25mm clear cover. Use M20 concrete and Fe250 steel.

18. (a) A lintel is to be designed for an opening 1.2m wide. The height of opening is 2m and the roof is 3.5m above the floor. Taking the weight of masonry as 19kN/m^3 and the thickness of wall is 230mm. Design the lintel by using M20 and Fe415 steel.

(Or)

(b) A reinforced concrete beam of 250mm wide and 400mm deep effective is subjected to a factored shear force of 200kN at supports. The tensile reinforcement at support A_{st} (%) is 0.5%. Find the spacing of 10mm dia. 2 legged stirrups to resist the shear at support. Use M25 concrete and Fe250 steel.

19. (a) Design a simply supported one way slab with clear span 3.6m using M20 and Fe415. Live load is 2kN/m^2. Floor finish load is 0.6kN/m^2. Bearing on walls is 200mm.

(Or)

(b) A staircase consists of independent cantilever steps of 300mm wide and 1.1m clear overhang. Live load on the stair is 3.0kN/m^2. Design the steps using M20 and Fe250 steel.

20. (a) A 400mm X 300mm R.C Column, 4m long effectively held in position at both ends and restrained against rotation at one end is required to carry an axial load of 900kN. Design the column with lateral ties. M20 concrete and Fe415 steel are used.

(Or)

(b) Design a square R.C Footing of uniform thickness for a R.C column 500mm X 500mm size carrying an axial load of 2000kN using M20 concrete and Fe250 Steel. The safe bearing capacity of soil is 150kN/m^2.

21. (a) Design a steel column using a single rolled steel '*I*' section to carry an axial load of 800kN. Both ends of the column are restrained against translation and rotation. The actual length of the column between intersections is 8m. The yield stress of steel is 280MPa.

(Or)

(b) Design a single angle tension member to carry a tensile force of 225kN due to dead load and live load. The angle is to be connected to a gusset plate through one of its legs by fillet welding.Take $f_y = 250\ N/mm^2$ and $f_u = 410\ N/mm^2$ (Connection need not to be designed)
