

**226****October 2017**

*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 modular ratio.
2. What is meant by characteristic strength of a material?
3. What is a T-beam?
4. Write down the bending moment co-efficient for continuous beam in all position.
5. List out any two differences between one way slab and two way slab.
6. What is meant by slenderness ratio for columns?
7. Mention any two rolled steel sections.
8. Define plastic section modulus of sections.

PART – B

9. Mention different limit states.
10. How will you find out the effective span of a simply supported beam?
11. What are the advantages of inclined stirrups over vertical stirrups?
12. What is meant by middle strip and edge strip?
13. State the IS code specifications regarding the longitudinal reinforcement and lateral reinforcement in RC columns.
14. Write the types of RC footings.
15. Define gross area and net area of tension member.
16. What are the assumptions made in design of columns by LSM?

PART – C

17. (a) A reinforced concrete simply supported beam 200mm wide and 500mm deep effective is reinforced with 3 Nos. of 16mm diameter bars. Find the moment of resistance of the beam. Effective span is 5.0m. Find the safe working load. If the effective cover is 40mm, find superimposed load. M20 and Fe250 are used.

(Or)

- (b) Design a cantilever beam of 3.0m span carrying a live load of 15kN/m. Use M20 and Fe415.

18. (a) Design a RC lintel for a clear opening of 1.5m resting over a brick wall of 300mm. The height of the wall above the lintel is 1.2m. The unit weight of masonry is 19kN/m<sup>3</sup>. Use M20 and Fe 250.

(Or)

- (b) A RC beam has an effective size of 250mm × 550mm. It is subjected to a total working load including self weight of 30kN/m on a span of 6m. It is provided with 4 numbers of 22mm dia bars in tension at support. Design the shear reinforcement. M20 concrete is used. Adopt Fe250 steel.

19. (a) Design a simply supported one way slab for a clear span of 3.8m with 300mm walls. Adopt live load of 5000N/m<sup>2</sup> and floor finish load of 500N/mm<sup>2</sup>. Use M20 and Fe415 steel.

(Or)

- (b) Design the flight slab of a dog legged staircase for a room 2.5m × 4.5m. The live load is 5.0kN/m<sup>2</sup>. Tread is 250mm and rise is 160mm. Steps are of reinforced concrete. M20 and Fe415 are used. Landing slab and flight slab spans are in perpendicular direction. Height of floor is 3.2m.

20. (a) Design a square column with lateral ties to carry an axial load of 1200kN using M20 concrete and Fe415 steel. Length of column is 3.5m and is effectively held in position at both ends and restrained against rotation at one end.

(Or)

- (b) A rectangular column 400mm × 600mm carries an axial load of 700kN. Design a rectangular footing of uniform thickness if safe bearing capacity of soil is 100kN/m<sup>2</sup>. Use M20 and Fe250.

21. (a) An ISLB 400@569N/m is used as a laterally restrained simply supported beam on an effective span of 5m. Determine the maximum udl it can carry in addition to its self weight, if the yield stress of steel is 250N/mm<sup>2</sup> and the deflection at mid span shall not exceed 25mm.

(Or)

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