314 Register No.:

April 2019

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 Engineers Handbook, IS-800:2007, Steel tables are permitted.]

PART – A

1. Draw stress block.
2. Specify the requirements for secondary reinforcement.
3. When torsion reinforcement is provided in two way slab?
4. Give the formula for finding shearing capacity of bent-up bars.
5. Mention the different classification of column based on slenderness ratio.
6. What is the maximum and minimum percentage of longitudinal reinforcement in column?
7. What do you mean by failure of tension members due to block shear?
8. List out the various limit states.

PART – B

9. What are the assumptions made in the limit state of collapse?
10. Mention the permissible limits of minimum and maximum area of reinforcement in beam.
11. Differentiate between one way slab and two way slab.
12. Explain with neat sketch the term middle strip and edge strip in two way slab.
13. Explain different types of shear stirrups.
14. What are the purpose of providing transverse reinforcement for a column?

[Turn over.....

15. State the different forms of tension members.

16. State the minimum cover thickness of longitudinal reinforcement in column of specify the minimum size and number of bars in a column.

PART – C

17. (a) A simply supported rectangular beam for 6.2m span carries a characteristic load of 25 KN/m inclusive of its self weight. The beam is 230mm × 600mm overall. Design the beam. The materials to be used are M20 grade concrete and Fe415 grade steel. The beam is resting on R.C.C. column of size 300mm × 300mm.

(Or)

(b) A doubly reinforced beam section is 230mm × 500mm overall. Its having 2 bars of 16mm diameter as compression steel and 4 bars of 20mm diameter as tensile steel with an effective cover of 40mm. Determine the ultimate moment of resistance of the beam section. Use M20 concrete grade and HYSD bars of grade Fe415.

18. (a) Design a simply supported roof slab for a hall of 4m×12m clear size, using M20 grade concrete and Fe415 grade steel. The width of walls allround is 230mm. Access is provided to the roof. The weight of weathering course is 1.5 KN/m^2.

(Or)

(b) Design a simply supported roof slab for a cabin of clear size 3.2m × 4m. The thickness of walls is 200mm. Access is not provided to the roof. The corners of the slab are not held down. The weight of weathering course will be 1.2 KN/m^2. Use M20 grade concrete and mild steel grade.

19. (a) A doubly reinforced rectangular cantilever beam is subjected to an axial shear force of 160 kN. The effective depth of the beam are 250 mm X 560 mm which are uniform throughout. The tension zone is reinforced with 4 nos. of 20mm diameter bars and compression zone is reinforced with 3 nos. of 20 mm diameter bars. Use M20 concrete and Fe415 steel. Determine the spacing of 8mm diameter 2 legged vertical stirrups near the support section.

(Or)

(b) Design a dog legged staircase for the building. The vertical height between two successive floors of a multi-storeyed residential building is 3.2 m. The clear size of the room is 2.5m × 4.5m.

20. (a) Design a circular column with circular ties to carry an axial load of 1300 kN. Assume 2% of steel. Use M20 grade concrete and Fe415 steel.

(Or)

(b) Design a square R.C footing of uniform thickness for a R.C. column of 500mm × 500mm carrying a total load of 2500 kN using M20 grade concrete and Fe415 grade steel. Safe bearing capacity of soil is 250 kN/m^2.

21. (a) Determine the compressive strength of a single *I* section ISHB 300@630 N/m when it is used as a column of effective length 4m. The yield stress of steel is 300 N/mm^2.

(Or)

(b) A 100mm × 8mm steel plate is connected at the end to a 10mm thick gusset by side fillet welds of 120mm length each. The yield and ultimate stresses of the material are 410 MPa and 540 MPa respectively. Determine the design tensile strength of plate.
