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

Question Paper Code: 1035165

B.E. DEGREE EXAMINATIONS, NOV/ DEC 2024
Fifth Semester
Civil Engineering
U20CE503 – DESIGN OF RC ELEMENTS
(Regulation 2020)

Time: Three Hours Maximum: 100 Marks

Answer ALL questions

PART – A (10 x 2 = 20 Marks)

1. Compare limit state of collapse and limit state of serviceability.
2. Point out the merits of ultimate method over elastic method.
3. Classify the different modes of shear failure in RC beams.
4. Differentiate under reinforced and over reinforced sections.
5. Define anchorage length.
6. Illustrate the check for shear and design of shear reinforcement in RC beams.
7. Define braced column.
8. Enumerate the term slender columns.
9. List out the types of combined footing.
10. How will you calculate the depth of footing based on Rankine's formula?

PART – B (5 x 16 = 80 Marks)

11. (a) A doubly reinforced beam with b = 250 mm and d = 500 mm has to carry a dead load moment of 80,000 Nm and a live load moment of 100,000 Nm. Using M20 concrete and Fe415 grade steel, calculate the required steel using Working stress method of Design. (16)

(OR)

(b) A beam, simply supported over an effective span of 8 m carries a live load of 15 kN/m. Design the beam, using M20 concrete and Fe415 grade steel. Keep the width equal to half the effective depth. Use Working stress method of Design. (16)

12. (a) Design a R.C. slab for a room measuring 5m x 6m size. The slab is simply supported on all the four edges, with corners held down and carries a superimposed load of 30 N/m², inclusive of floor finishes etc. Use M20 mix, Fe415 steel and IS code method. (16)

(OR)

(b) A simply supported one way slab of 4 m span carries a live load of 3 N/m^2 and the load of floor finish as 1.25 kN/m^2. The slab, having a total depth of 150 mm is reinforced with 8 mm dia bars @ 100 mm c/c at a nominal cover of 20 mm. Assuming a permanent load equal to dead load plus 20% of live load, compute the total maximum deflection and check it as per code requirements. Use M20 concrete and Fe415 steel. (16)

13. (a) Check for the development length at support of a doubly reinforced beam 400 mm X 750 mm (effective) the clear span of the beam is 5.25 m. The beam carries UDL of 46 kN/m (including self-weight). The beam is reinforced with 8 bars of 20 mm diameter (4 are bent up near support) on tension side and 4 bars of 16 mm diameter on compression side. Adopt M20 grade concrete and Fe415 HYSD bars. (16)

(OR)

(b) A rectangular beam with b = 350 mm and d = 550 mm has a factored shear of 400 kN at the critical section near the support. The steel at the tension side of the section consists of four 32 mm dia bars which are continued to support. Assuming fck = 25 N/mm^2 and fy = 415 N/mm^2 design the vertical stirrups for the section. Use limit state method. (16)

14. (a) Design a circular column of diameter 400 mm with helical reinforcement subjected to a working load of 1200 kN. Use M25 concrete and Fe415 steel. The column has unsupported length of 3 m and it is effectively held in position at both the ends, but not restrained against rotation. (16)

(OR)

(b) Design a rectangular column of 4.5 m unsupported length, restrained in position and direction at both the ends, to carry an axial load of 1200 kN. Use M20 concrete and Fe415 steel. (16)

15. (a) Design a reinforced concrete two column combined footing of a multistoried building. The columns are arranged in square grid 16m x 16 m with their spacing 4 m apart. The SBC of soil at site is 100kN/m^2. The total service load on the column is 4800 kN. The columns are 400mm x 400 mm in section. Adopt M20 concrete and Fe415 bars. Sketch the details of reinforcements in the raft foundation. (16)

(OR)

(b) Design a square footing for a short axially loaded column of size 300mm x 300 mm carrying 600 kN load. Use M20 concrete and Fe415 steel. SBC of soil is 180 kN/m^2 Sketch the details of reinforcement. (16)

------xxxx------