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Question Paper Code : 40805

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018
Fifth Semester
Civil Engineering
CE 6505 – DESIGN OF REINFORCED CONCRETE ELEMENTS
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

IS 456-2000 and SP16 permitted.
Assume any missing data suitably.
Use of relevant BIS standards and Handbooks is permitted.
Answer ALL questions

PART – A **(10×2=20 Marks)**

1. What are the advantages of ultimate method over elastic method ?
2. Define limit state of collapse and limit state of serviceability.
3. Differentiate under reinforced and over reinforced sections.
4. What are the different modes of shear failure in RC beams ?
5. Explain the check for shear and design of shear reinforcement in RC beams.
6. What is meant by anchorage length ?
7. What are slender columns ?
8. How do you calculate the depth of footing based on Rankine's formula ?
9. What are the types of combined footings ?
10. List out any two factors which affect the permissible stress of a masonry ?

PART – B (5×13=65 Marks)

11. a) 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.

(OR)

b) 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.

12. a) A simply supported one way slab of 4 m span carries a live load of 3 N/m² and the load of floor finish as 1.25 kN/m². The slab, having a total depth of 150 mm is reinforced with 8 mm Φ 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.

(OR)

b) Design a R.C. slab for a room measuring 5 m × 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.

13. a) 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 f_{ck} = 25 N/mm² and f_y = 415 N/mm², design the vertical stirrups for the section. Use Limit state method.

(OR)

b) Check for the development length at support of a doubly reinforced beam 400 mm × 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.

14. a) 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.

(OR)

b) 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.

15. a) Design a square footing for a short axially loaded column of size 300 mm × 300 mm carrying 600 kN load. Use M20 concrete and Fe415 steel. SBC of soil is 180 kN/m². Sketch the details of reinforcement.

(OR)

b) Design a reinforced concrete raft foundation connecting the columns of a multistoried building. The columns are arranged in square grid 16 m × 16 m with their spacing 4 m apart. The SBC of soil at site is 100 kN/m². The total service load on the column is 4800 kN. The columns are 400 mm × 400 mm in section. Adopt M20 concrete and Fe415 bars. Sketch the details of reinforcements in the raft foundation.

PART – C (1×15=15 Marks)

16. a) i) Explain the step by step procedure of design of masonry walls. (8)

ii) How do you improve lateral load resisting capacity of masonry walls ? (7)

(OR)

b) Determine the reinforcement to be provided in a short column subjected to biaxial bending, with the following data : size of column = 400 × 600 mm. Concrete mix = M15. Characteristic strength of reinforcement = 415 N/mm². Factored load, Pu = 1600 kN. Factored moment acting parallel to the larger dimension, Mux = 120 kNm. Factored moment acting parallel to the shorter dimension, Muy = 90 kNm. Moments due to minimum eccentricity are less than the values given above.

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