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Question Paper Code : 91308

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019
Fifth Semester
Civil Engineering
CE 6505 – DESIGN OF REINFORCED CONCRETE ELEMENTS
(Regulations 2013)
(Use of IS 456-2000, is Permitted)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Write any two assumptions are made in elastic theory method.

2. What is the formula used to find the critical neutral axis in working stress method ?

3. Differentiate between under reinforced and over reinforced section.

4. Enumerate balanced section.

5. What is the important mechanism of shear resistance in beams with web reinforcement ?

6. Define flexural bond and anchorage bond.

7. What is the need of minimum eccentricity clause for a column design ?

8. What is meant by braced column ?

9. What is punching shear in RCC footing ?

10. What is one way and two way shear in footing ?

PART – B **(5×13=65 Marks)**

11. a) Explain the codal recommendations for limit states design.

(OR)

b) Design a rectangular section for a simply supported reinforced concrete beam of effective span of 5 m carrying a concentrated load of 40 kN at its mid span. The concrete to be used is of grade M20 and the reinforcement consists of Fe 415 steel bars.
   i) Self weight of beam is ignored
   ii) Self weight of beam is considered.
   Use working stress method.

12. a) Design a T- beam section with a flange width of 1200 mm, a flange depth of 100 mm, a web width of 250 mm and an effective depth of 500 mm, which is subjected to a factored moment of 550 kNm. The concrete mix is to be used is of grade M20 and steel is of grade Fe415. Use limit state method.

(OR)

b) Design a slab over a room 5m × 7m as per I.S. code. The slab is supported on masonry walls all round with adequate restraint and the corners are held down. The live load on the slab is 330 N/m^2. The slab has a bearing of 150 mm on the supporting walls.

13. a) i) Explain the terms Diagonal tension and bond stress with reference to R.C. beams.
   ii) Obtain an expression for calculation of bond stress and shear stress in case of reinforced concrete beams of rectangular section with tensile steel of diameter (Φ). Also obtain relationship between bond stress and shear stress.

(OR)

b) A beam of rectangular section is reinforced with 6 nos of 18 mm diameter bars in tension and is supported on an effective span of 5 m, the beam being 300 mm wide and 700 mm deep. The beam carries a uniformly distributed load of 42 kN/m. Design the shear reinforcement considering no bars are bent up for shear. Assume $\sigma_{sv} = 230\ N/mm^2$, $\tau_c = 0.30\ N/mm^2$, $f_y = 415\ N/mm^2$.

14. a) Design a short column to carry an axial load of 1200 kN and moment of 60 kNm about the major axis. The effective height of column is 3 m.

(OR)

b) Design the reinforcement for a column of size 250 mm × 300 mm if it is subjected $P_u = 500$ kN, $M_{ux} = 50$ kNm and $M_{uy} = 30$ kNm. Provide effective cover of 50 mm.

15. a) A rectangular RCC column of size 400 mm × 600 mm carrying an axial load of 1800 kN. If the safe bearing capacity of the soil is 150 kN/m^2. Design a suitable footing. Use M20 concrete and Fe415 steel.

(OR)

b) Design a suitable footing for a 500 mm × 500 mm square column transferring 100 kN axial load and a moment of 35 kN/m. The safe bearing capacity of soil is 190 kN/m^2 use M20 concrete and Fe415 steel. Adopt limit state design method.

PART – C **(1×15=15 Marks)**

16. a) Design a Doubly Reinforced Rectangular simply supported beam at both ends to carry a live load of 25 kN/m and super imposed dead load of 16 kN/m over a clear span of 7 m use M25 and Fe415 are used.

(OR)

b) A RCC section 200 × 400 mm is subjected to a characteristic torsional moment of 2.5 kN/m. and a transverse shear of 60 kN. Assuming the use of M-25 grade concrete and Fe415 HYSD bars. Determine the reinforcement required according to the IS 456 code provisions, using the given data. Assume necessary data if necessary.

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