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Question Paper Code : X65513

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Sixth Semester
Civil Engineering
080100035 – DESIGN OF R.C. ELEMENTS
(Regulations 2008)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. What is the main concept of Elastic method ?
2. Write a short note on Limit State Philosophy of structural design.
3. On what circumstances doubly reinforced sections are suitable.
4. Write a short note on side face reinforcement to be provided along the two faces of beams.
5. Define limit state of collapse in shear.
6. What do you mean by diagonal tension ?
7. Define effective length of column.
8. What are the factors that affect behavior of slender columns ?
9. Write a short note on overturning and sliding.
10. What is the importance of plain concrete footings ?

PART – B **(5×16=80 Marks)**

11. a) i) Explain the advantages of limit state method over other methods. **(10)**

ii) What are the assumptions in working stress method ? **(6)**

(OR)

b) i) A rectangular R.C. Section having a width of 350 mm is reinforced with 2nos of 28 mm dia. and 2 nos of 25 mm dia. at an effective depth of 700 mm. Adopting M_{20} grade concrete and Fe_{415} HYSD bars. Determine the ultimate moment of resistance of the section. **(10)**

ii) What are the assumptions on limit state method. **(6)**

12. a) Design a T-beam section with a flange width of 1250 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 560 kNm. The concrete mix to be used is of grade M20 and steel is of Fe 415. Draw the reinforcement details. **(16)**

(OR)

b) Design a one-way slab, with a clear span of 4.0 m, simply supported on 230 mm thick masonry walls and subjected to a live load of 4 kN/m^2 and a surface finish of 1 kN/m^2. Assume Fe 415 steel and also assume that the slab is subjected to moderate exposure conditions. **(16)**

13. a) i) Under what situations do the following modes of cracking occur in reinforced concrete beams

1) Flexural cracks.

2) Diagonal tension cracks.

3) Flexural-shear cracks.

4) Splitting cracks. **(12)**

ii) Stirrups may be open or closed. When does it become mandatory to use closed stirrups ? **(4)**

(OR)

b) Design the torsional reinforcement in a rectangular beam section, 350 mm wide and 750 mm deep, subjected to an ultimate twisting moment of 140 kN/m combined with an ultimate (hogging) bending moment of 200 kN/m and an ultimate shear force of 110 kN. Assume M25 concrete, Fe415 steel and mild exposure conditions. **(16)**

14. a) Rectangular column of effective height of 4 m is subjected to a characteristic axial load of 800 kN and bending moment of 100 kNm about the major axis of the column. Design a suitable section for the column and the reinforcements required. Assume f_y = 415 N/mm^2 f_{ck} = 20 N/mm^2. **(16)**

(OR)

b) A column 350 mm × 350 mm has an unsupported length of 8 m and equivalent length of 5 m about both the axes. It is loaded with characteristic loads P = 50 T, M_{xx} (top) = 40 kNm, M_{xx} (bottom) = –25 kNm. Assuming the column to be bent in double curvature, design the steel required of f_{ck} = 30 N/mm^2 and fy = 415 N/mm^2. **(16)**

15. a) Design a suitable footing for a R.C. column of size 300 × 500 mm. Supporting a factored axial load of 1500 kN. Assume safe bearing capacity of soil as 200 kN/m^2. Adopt M20 grade and Fe415 grades. Sketch the details at reinforcements in footings. **(16)**

(OR)

b) Design a combined footing for the two columns at a multistorey building. The columns of size 400 mm × 400 mm transmit a working load of 300 kN each and they are spaced at 5 m centres. The safe bearing capacity of soil at site is 200 kN/m^2. Adopt M20 grade concrete and Fe415 grade steel. Sketch the details of reinforcements in the combined footing. **(16)**

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