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Question Paper Code : 41010

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Sixth Semester

Civil Engineering

080100035 — DESIGN OF RC ELEMENTS

(Regulation 2008)

Time : Three hours Maximum : 100 marks

(Use of IS 456–2000 and SP 16 is permitted)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is meant by modular ratio?
2. Write down the advantages of limit state method over other methods.
3. What are the assumptions in the theory of design of doubly reinforced beam regarding the role of compression steel?
4. Distinguish between one way slab and two way slab.
5. Differentiate primary and secondary torsion.
6. What do you mean by punching shear?
7. Define effective length of column.
8. What are the factors that affect behavior of slender columns?
9. When can a foundation be considered as rigid?
10. What are one way and two way shears in footing?

PART B — (5 × 16 = 80 marks)

11. (a) Explain in detail about the following methods of design of reinforced concrete structures along with IS code specifications.

(i) Elastic method (5)

(ii) Ultimate load method (5)

(iii) Limit state method (6)

Or

(b) Design a reinforced rectangular beam of breadth 300 mm to carry a characteristic live load of 12 kN/m over an effective span 8m using M20 grade concrete and Fe415 steel by the working stress method. (16)

12. (a) A simply supported floor slab 6.5m × 3m has to carry a half brick partition wall of reinforced brickwork 3m in height built along the full 3m span at the centre of the slab in addition to an imposed characteristic load of 2.5 kN/m^2. Design the floor slab assuming f_{ck} 20N/mm^2 f_y = 415 N/mm^2. (16)

Or

(b) Design a doubly reinforced rectangular reinforced concrete beam to resist service moments of 120 kNm from dead loads and 110 kNm from live loads. The width of the beam is 250 mm. Use 10 mm stirrups f_y = 250 N/mm^2 f_{ck}= 20 N/mm^2. (16)

13. (a) A rectangular RCC beam is 400 × 900 mm in size. Assuming the use of grade 25 concrete and Fe 415 steel, determine the maximum ultimate torsional moment the section can take if (16)

(i) No torsion reinforcement is provided

(ii) Maximum torsion reinforcement is provided

Or

(b) (i) A rectangular section of a simply supported beam is 250 × 420 mm in section with effective cover of 40mm to centre of reinforcement. It has 4 nos of 12 mm bay continued to the supports. Find the shear capacity at the support if the shear steel consists of double vertical stirrup of 8 mm dia at 200 mm spacing. Assume f_y = 250 N/mm^2 f_{ck} = 20 N/mm^2. (11)

(ii) Explain how shear stress is calculated in beams of varying depth. (5)

14. (a) A rectangular column of effective height of 4m 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 8m and equivalent length of 5m about both the axes. It is loaded with characteristic loads P = 50T, 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 f_y = 415 N/mm^2. (16)

15. (a) A brick wall 300mm thick is used for a double storey building 4m high from the foundation to the ground floor and 3m high from the first floor to the roof. Assuming rooms to be 4m square, Design a suitable reinforced concrete continuous footing for the above wall. Sketch the details of steel. Use M15 Concrete and Fe 415 steel. Safe bearing capacity is 100kN/m^2. (16)

Or

(b) Design a footing for a rectangular column 300 × 450 mm carrying an axial factored load of 1500 kN. The safe bearing capacity of the soil is 120 kN/m^2. Use M_{20} concrete and Fe 415 steel. (16)
