B.E. DEGREE EXAMINATIONS: APRIL/MAY 2011

Sixth Semester

CIVIL ENGINEERING

U07CE605: Design of Reinforced Concrete Elements

Use IS: 456-2000 & SP-16

Time: Three Hours   **Maximum Marks: 100**

Answer ALL Questions:-

PART A (10 x 1 = 10 Marks)

1. Working stress method is also called as

   a) Modular Ratio Method   b) Load factor method   c) Limit state method   d) 1&2

2. Partial safety factor for steel material is

   a) 1.5   b) 1.1   c) 2   d) 1.15

3. Maximum limiting value of Xu/d for mild steel is

   a) 0.48   b) 0.53   c) 0.46   d) 0.47

4. Minimum clear cover as per IS 456 under moderate exposure condition is

   a) 40mm   b) 15mm   c) 25mm   d) 50mm

5. Lap length in compression should not be more than

   a) 5Ld   b) 20φ   c) 3Ld   d) 24φ

6. Minimum shear reinforcement is given by

   a) Asv/(b.Sv) = 0.4/0.87fy   b) Asv/(b.Sv) > 0.4/0.87fy

   c) Asv/(b.Sv) < 0.4/0.87fy   d) Asv/(b.Sv) = 0.4/0.64fy

7. Maximum percentage of longitudinal steel for column is

   a) 0.8% of Ac   b) 1% of Ac   c) 4% of Ac   d) 6% of Ac

8. For what condition, the effective length of column with joint translation is '2L'

   a) End conditions restrained

   b) One end rotation restrained and other end unrestrained

   c) One end rotation partially restrained and other end unrestrained

   d) Partially restrained at both ends

9. Minimum thickness of edge of footing on soil and rock

   a) 200mm   b) 300mm   c) 150mm   d) 400mm

10. In footings, punching shear occurs at

    a) At a distance 'd' from column face   b) At a distance 'd/2' from column face

    c) At a distance 'd/4' from column face   d) At a distance 'd/3' from column face

PART B (10 x 2 = 20 Marks)

11. What are the methods used to design reinforced concrete members?

12. Differentiate between balanced and under-reinforced sections

13. What are the different types of slabs available and define two-way slab

14. Define flanged beam

15. What are the different types of shear failure?

16. Define development length of bar

17. Differentiate between short column and long column

18. What is the maximum limit for lateral ties in column as per IS code

19. What are the different loads acting on the slab?

20. How to check one-way shear in footing?

PART C (5 x 14 = 70 Marks)

21. a) Explain the methods used to design reinforced concrete members.

(OR)

b) A rectangular beam of breadth 250mm and effective depth 800mm with cover of 40mm to centre of steel is to be designed for M20 grade concrete and Fe250 grade steel by using SP-16 in working stress method. Determine the area of steel required if the moment due to characteristic load it has to carry is (i) 150 kN-m (ii) 200 kN-m

22. a) Design a reinforced concrete slab 6.3m x 4.5m simply supported on all the four sides. It has to carry a characteristic live load of $5kN/m^2$ in addition to its self weight. Assume M25 concrete and Fe415 steel. Also assume that the exposure condition to environment can be classified as mild.

(OR)

b) A T-beam has to develop an ultimate moment of resistance to 450kN-m. its web width is 200mm, flange width 750mm, slab thickness 100mm and total depth 550mm. determine the necessary steel fro the section using M20 concrete and Fe415 steel. Assume cover to centre as steel to be 50mm.

23. a) A rectangular-beam of web width 350mm, depth 700mm, is subjected to the following loads, BM–100m, Shear–50kN and Torsion–30kN-m. Assuming fck–30 N/mm^2 and fy–415N/mm^2. Assume cover to centre as steel to be 50 mm. Design the reinforcement according to IS: 456.

(OR)

b) A simply supported beam is 6m in span and carries a characteristic load of 60kN/m. if 6nos of 20mm bars are provided for a section of 300 x 600 mm. Design shear reinforcement. Assume m20 and Fe415.

24. a) Determine the longitudinal steel required for a column 400mm x 600mm carrying Pu 1600kN, factored moment(major axis)–120kN-m, factored moment(minor axis) – 90kN-m. assume fck – 20 N/mm^2 and fy – 415 N/mm^2 and d' – 60mm.

(OR)

b) Design the longitudinal steel for a braced column 500mm x 400mm bent in a single curvature with fck – 40 N/mm^2 and fy – 415 N/mm^2 and the following data

- Effective length about both axes   - 6.5m
- Unsupported length   - 7m
- Factored load   - 2500kN
- Factored moments on major axis   - 250kN-m @ top and 200 kN-m @ bottom
- Factored moments on minor axis   - 120kN-m @ top and 100 kN-m @ bottom

25. a) A solid footing has to transfer a dead load of 1000kN and imposed load of 400kN from a square column 400mm x 400mm with 16mm bars. Assuming with fck – 40 and fy – 415 N/mm^2 and safe bearing capacity to be 200kN/m^2. design the footing.

(OR)

b) Explain the procedure for the design of sloped footing.

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