

Register Number:

**3105**

Name of the Candidate:

**B.E. DEGREE EXAMINATION, 2010**  
**(CIVIL /CIVIL AND STRUCTURAL ENGINEERING)**  
**(FOURTH SEMESTER)**  
**CLEC-405.STRUCTURAL ENGINEERING-I**  
**(Old Regulation)**

**(For the students joined 2006-2007 and before)**

Nov)

(Time: 3 Hours

Maximum: 60 Marks

*Answer any ONE full question form each unit*  
*Assume suitable data wherever necessary*  
*Using IS456-2000,SPII, IS800-1984 and steel*  
*All questions carry equal marks*

**UNIT-I**

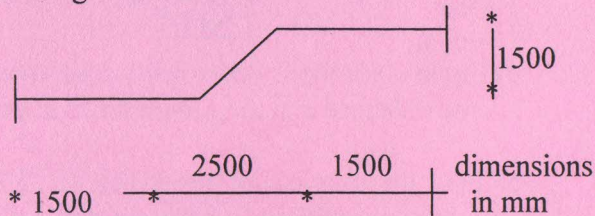
1. a) Explain the terms under reinforced, over reinforced and balanced and their importance in design. (4)  
b) Find the moment of resistance of 230×450 beam reinforced with 3-16@bottom and 3-12@top. The grade of concrete is M20 an steel is Fe500, using working stress method. (8)
2. Design a slab of size 4.0×6.0m with three edges continuous and one long edge discontinuous condition. Dead imposed load is 3kN/m<sup>2</sup> and live load is 4kN/m<sup>2</sup> in addition to the self weight. Use Fe415 & M20 concrete. Use limit state method. (12)

2  
UNIT-II

3. Design a column of size  $230 \times 300$  to carry a load of  $100 \text{ kN}$  and uniaxial moment of  $10 \text{ kN-m}$ . M20 and Fe415 steel to be used. The height of the column is  $4.5 \text{ m}$ . The column shall be assumed to be hinged @ both the ends.
4. Design a combined footing for two columns of size  $300 \times 300$  and  $300 \times 450$  with  $400 \text{ kN}$  and  $800 \text{ kN}$  axial loads. The SBC of the soils is  $150 \text{ kN/m}^2$  and the spacing between columns is  $3.5 \text{ m}$ . Use M20 & Fe415 steel.

UNIT-III

5. The section of a flight of a dog legged staircase is shown below. Design the stair for a live load  $5 \text{ kN/m}^2$ . The width of the stair is  $1.5 \text{ m}$ . Use Fe415 & M25 grade concrete.



6. Design a stair case  $1.5 \text{ m}$  wide for total size of  $4 \text{ m}$  if the space available is  $4.5 \text{ m} \times 5.5 \text{ m}$ . The stairs are assumed to span horizontally and supported by a central stringer beam. Design the stringer beam if the live load is  $4 \text{ kN/m}^2$  and Fe415 & M20 grade concrete is to be used.

3  
UNIT-IV

7. A simply supported beam is to carry a load of  $20 \text{ kN/m}$ . The beam ends are resting on  $M250 \text{ mm}$  thick walls with bearings plates with clear span  $6.25 \text{ m}$ . The beam supports a floor slab. Design the beam with  $f_y = 250 \text{ MPa}$ .
8. A plate girder has the following mild steel plate elements: Each flange:  $400 \times 16$  and web  $640 \times 12$ . The beam is simply supported about both axes @  $8 \text{ m}$  apart supports. Determine the moment capacity of the section if the top flange is unrestrained.

UNIT-V

9. In a  $16 \text{ m}$  span truss, the bottom tie ISA  $60, 60, 6$  is subjected to  $52.5 \text{ kN}$  tension. Design a joint between the tie and gusset plate using rivets. (12)
10. Design a laced column to carry an axial load of  $1400 \text{ kN}$  is the effective length  $6.5 \text{ m}$  in both planes. Use a compound section with channel sections.

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