

Register Number :

Name of the Candidate :

5 8 7 2

**B.E. DEGREE EXAMINATION, 2007**

**(CIVIL, CIVIL AND STRUCTURAL ENGINEERING)**

**(FOURTH SEMESTER)**

**CLEC - 404 / CSEC - 404 / PCSEE - 202.**

**MECHANICS OF SOLIDS - II**

*( Common with Part - Time - Structural  
Engineering - Second Semester )*

April ]

[ Time : 3 Hours

**Maximum : 60 Marks**

*Answer ALL questions.*

*All questions carry equal marks.*

**Turn over**

## UNIT - I

1. (a) Fig. (i) shows a truss with a span of 5 m and carrying a load of 5 kN at its apex. Find the forces in all the members of the truss by any one method. (8)

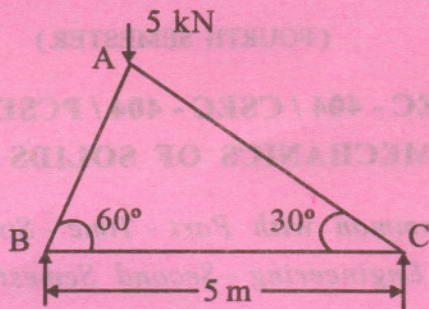


Fig. (i)

- (b) Explain the analysis of truss by graphical method. (4)
- (OR)
2. Determine the vertical and horizontal displacements of the point 'C' of the pin-jointed frame shown in fig. (ii). The cross-sectional area of AB is 100 sq.mm and of



AC and BC 150 sq.mm each.  $E = 2 \times 10^5 \text{ N/mm}^2$ .

Use unit load method. (12)

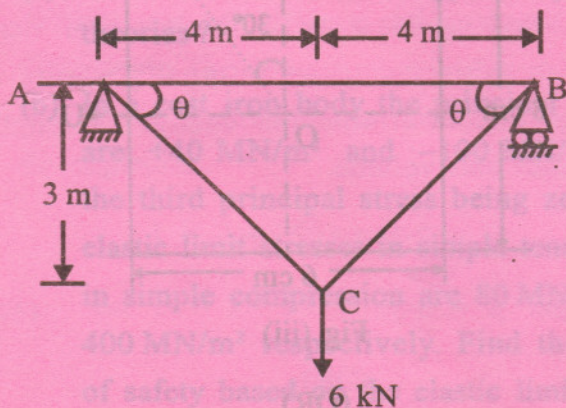
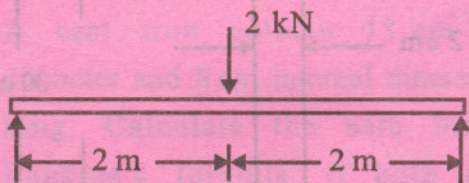


Fig. (ii)

### UNIT - II

3. A beam is loaded as shown in fig.(iii). Determine the maximum deflection and stress at 'B'.  $E = 210 \text{ GPa}$ . (12)



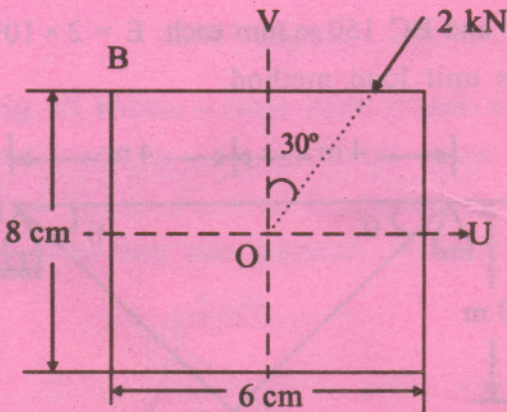
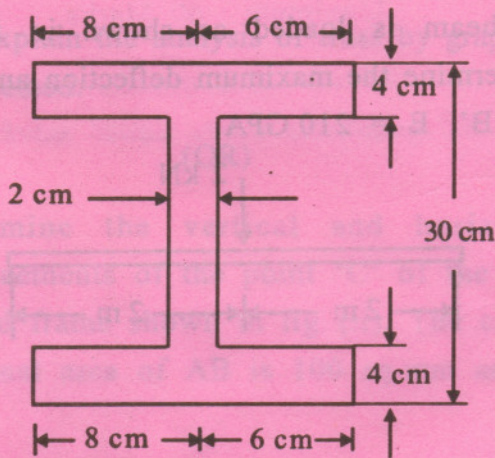


Fig. (iii)

(OR)

4. Determine the position of the shear centre of the section of a beam shown in fig.(iv).



(12)



## UNIT - III

5. (a) What are the different types of principal theories? (4)

(b) In a cast iron body the principal stresses are  $+40 \text{ MN/m}^2$  and  $-100 \text{ MN/m}^2$  and the third principal stress being zero. The elastic limit stresses in simple tension and in simple compression are  $80 \text{ MN/m}^2$  and  $400 \text{ MN/m}^2$  respectively. Find the factor of safety based on the elastic limit, if the criterion of failure is the maximum principal stress theory. (8)

(OR)

6. (a) What are the limitations of Euler's formula? (4)

(b) A cast iron column 13 cm external diameter and 8 cm internal diameter is 3 m long. Calculate the safe load using Rankine's formula, if both ends are hinged.  $f_c = 6,000 \text{ kg/cm}^2$  and  $\alpha = \frac{1}{1,600}$ . Adopt factor of safety of 3.

Turn over

## UNIT - IV

7. A thin cylindrical shell one metre in diameter and 3 m long has a metal thickness of 1 cm. If it is subjected to an internal pressure of  $30 \text{ kg/cm}^2$ , determine the change in length, diameter and volume.

$$E = 2.1 \times 10^6 \text{ kg/cm}^2.$$

$$\text{and } \mu = 0.3. \quad (12)$$

(OR)

8. The maximum stress permitted in a thick cylinder radii 20 cm and 30 cm is  $160 \text{ kg/cm}^2$ . If the internal pressure is  $120 \text{ kg/cm}^2$ , what external pressure can be applied? (12)

## UNIT - V

9. Write note on :

(i) Natural vibrations. (4)

(ii) Forced vibrations. (4)

(iii) Critical speed of shaft. (4)

(OR)

10. A Uniform steel beam, 2 m long, is simply supported at its ends and carries loads 1,000 N at distance of 500 mm from each support. Determine the lowest natural frequency for the system if the mass of the beam itself may be neglected.

$$I = 2 \times 10^5 \text{ mm}^4.$$

$$\text{and } E = 2 \times 10^5 \text{ N/mm}^2.$$