3E2011

Roll No. : _____ Total Printed Pages : 4

3E2011

B. Tech. (Sem. III) (Main/Back) Examination, January - 2013
Civil Engg.
3CE1 Strength of Materials and Mechanics of Structures-I

Time : **3** Hours] [Total Marks : **80**
[Min. Passing Marks : **24**

*Attempt any **five** questions, selecting **one** question from each unit. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. Nil **2.** Nil

UNIT - I

1 (a) Prove that the total elongation of a uniformly tampering rod of length 'L' and end diameters D_1 and D_2, when rod is subjected to an axial force P is given by

$$dl = \frac{4 P L}{\pi E D_1 D_2}$$

8

(b) A steel rod of 30 mm diameter and 5 m long is connected to two grips and the rod is maintained at a temperature of 95°C. Determine the stress and pull exerted when the temperature falls to 30°C, if :
(i) The end do not yield
(ii) The end yield by 1.2 mm.
Take $E = 2 \times 10^5$ N/mm^2 and coefficient of thermal expansion $\alpha = 12 \times 10^{-6}$/°C .

8

OR

1 (a) Find the axial deformation of the rod as shown in **fig. 1**. Take $E = 2.05 \times 10^5$ N/mm^2. Given $AB = CD = 1$ m and $BC = 1.2$ m. Diameters of portions AB and $CD = 30$ mm and diameter of portion $BC = 35$ mm.

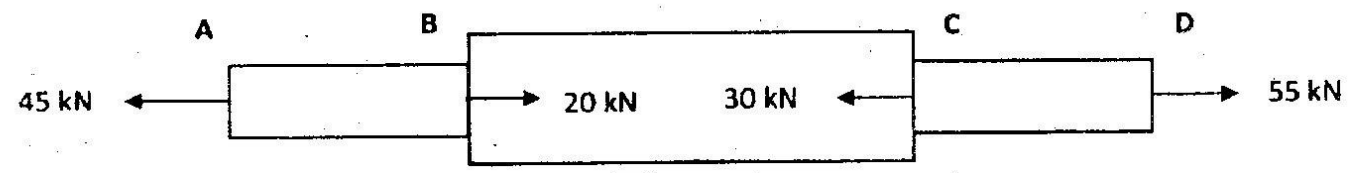


Fig. 1

10

(b) Define Strain Energy and Resilience. Write formulae for stress produced and strain energy due to gradually applied load, suddenly applied load and impact load.

6

UNIT - II

2 (a) A point in strained material is subjected to normal tensile stresses of 120 N/mm^2 and 60 N/mm^2 on mutually perpendicular planes together with a shear stress of 70 N/mm^2. Find the Principal Stresses, position of Principal planes and maximum shear stress in the block.

8

(b) Explain clearly, the Mohr's Circle method of finding out stresses in a rectangular element subjected to normal stresses p_1 and p_2 along with a shear stress q.

8

OR

2 (a) Define slenderness ratio of a column. What is its importance? Write down the values of effective length of a column for different end conditions.

8

(b) Compare the crippling loads given by Euler's and Rankine formulae for a 3 m long hollow steel column having inner and outer diameters as 48 mm and 52 mm respectively. The column is pin jointed at both the ends. The yield stress is 320 N/mm^2. Rankine's constant is 1/7500 and Modulus of Elasticity (E) = 2×10^5 N/mm^2.

8

UNIT - III

3 Determine Centroidal Moments of Inertia, Product Moment of Inertia and Principal Moments of Inertia of an L-Section as shown in **Fig. 2**.

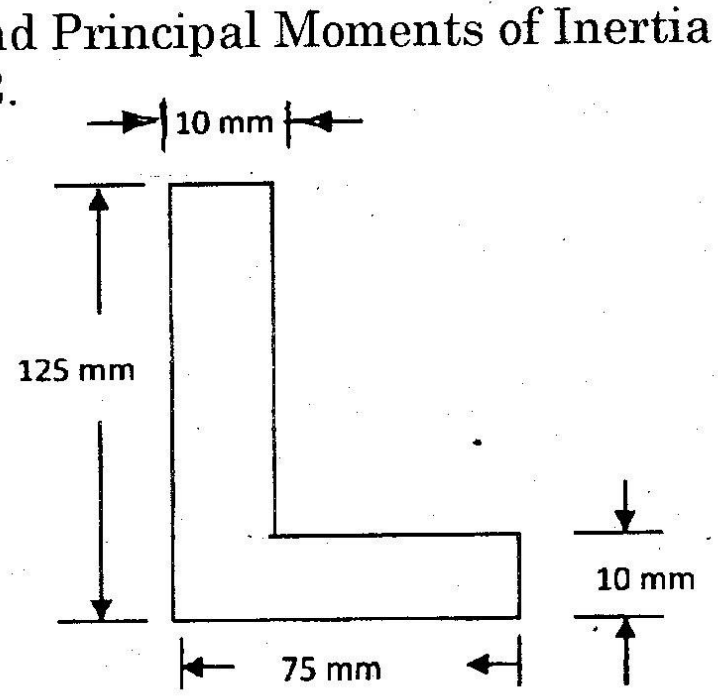


Fig. 2

16

OR

3 Write the assumptions made in analysis of a truss by the method of joints. Determine the forces in all the members of a pin-jointed truss as shown in **fig. 3** having hinge support at A and roller support at E. Length $AE = ED = DC = 3$ m.

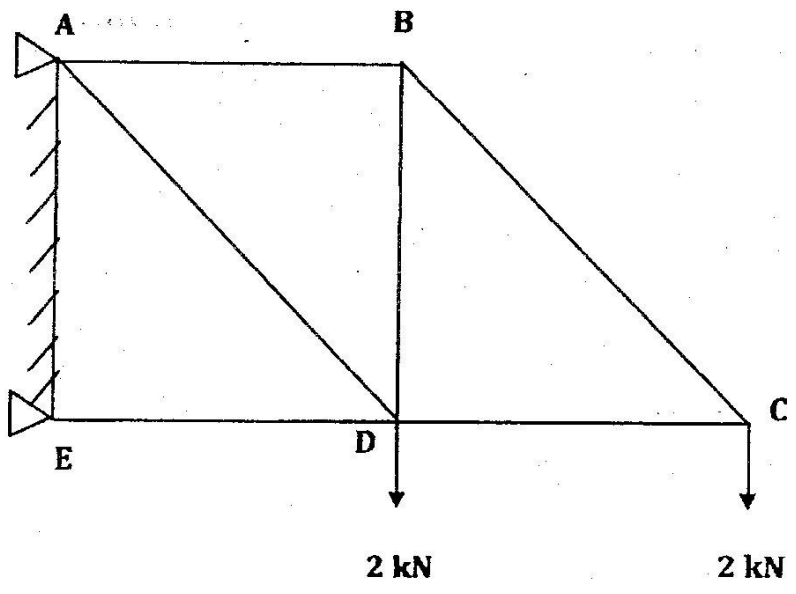
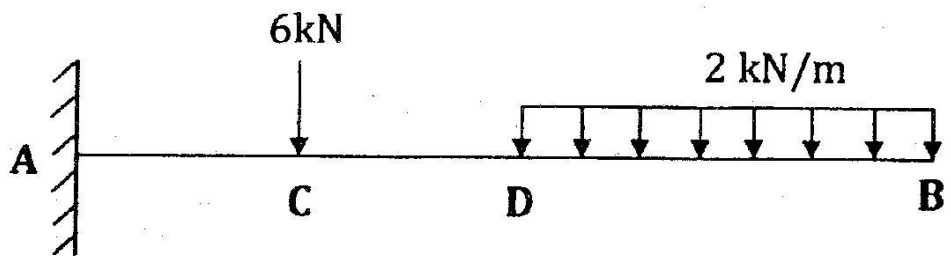


Fig. 3

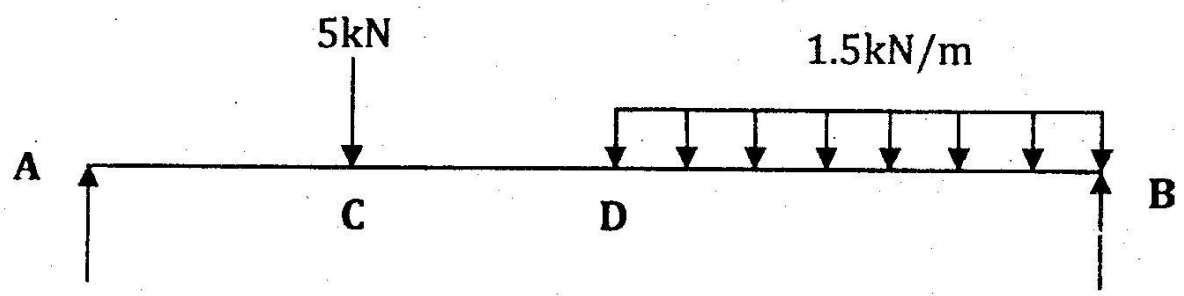
UNIT - IV

4 Draw Shear Force and Bending Moment diagrams for the beams as shown in **fig. 4 (a)** and **(b)**.



AC = CD = 3 m and DB = 6 m

Fig. 4 (a)



AC = CD = 2.5 m and DB = 5 m

Fig. 4 (b)

8+8

OR