3E2011

Roll No. : _____ Total Printed Pages : 4

3E2011

B.Tech. (Sem. III) (Main/Back) Examination, January - 2012
Civil Engg.
3CE1 Strength of Materials and Mechanics of Structures-1

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

Instructions to Candidates :

*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.*

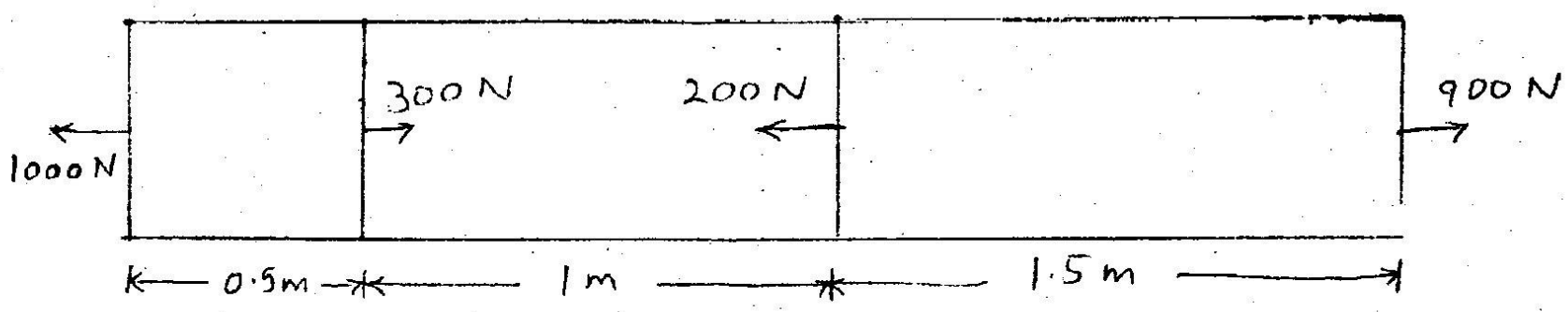
Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. Nil 2. Nil

UNIT - I

1 (i) Explain what do you mean by Thermal Stresses. **6**

(ii) A steel bar of cross-section 100 mm^2 is acted upon by the forces shown in **Fig. 1** below. Determine the total elongation of the bar. Take $E = 2 \times 10^5 \, N/mm^2$



10

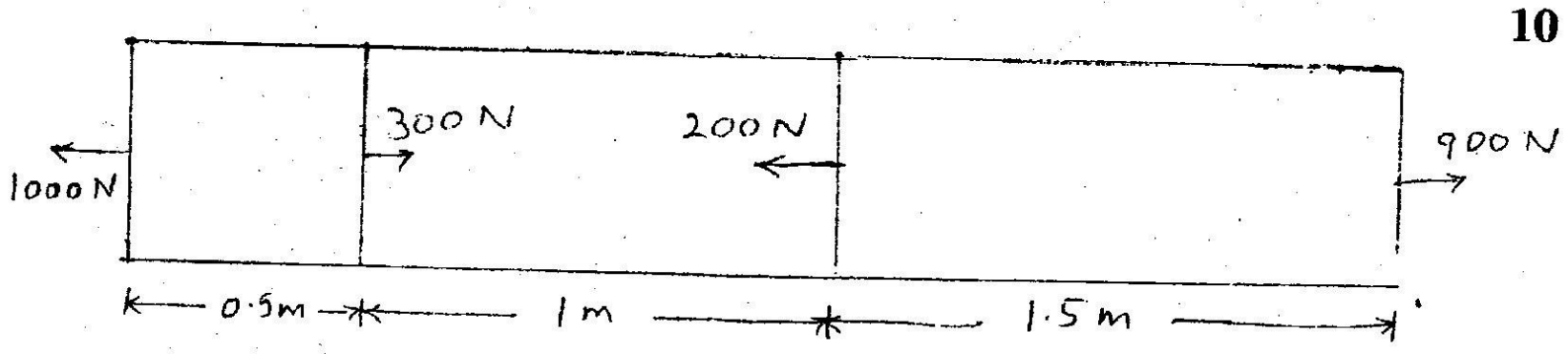
OR

1 (i) Define : Poisson's ratio, Bulk Modulus, Modulus of Rigidity. **2×3=6**

(ii) Two vertical rods, one of steel and other of copper are each rigidly fixed at top and 50 cm apart. Diameter and lengths of each rod are 2cm and 4 cm respectively. A cross bar fixed

to the rods at the lower ends carries a load of 5000N such that the cross bar remains horizontal even after loading. Find the stress in each rod and the position of the load on the bar. Take E for steel = $2\times10^5\ N/mm^2$ and E for copper = $1\times10^5\ N/mm^2$.

10



UNIT - II

2 (a) Explain what do you mean by principal stresses.

4

(b) At a certain point in a strained material, the principal stresses are 1000 N/cm^2 and 400 N/cm^2, both tensile. Using and explaining the Mohr's circle of stresses and its construction, find the normal, tangential and resultant stresses across a plane, through the point at 48^0 to major principal plane.

12

OR

2 (i) Explain the state of simple shear.

4

(ii) Compare the ratio of the strength of a solid steel column to that of a hollow column of the same cross-sectional areas. The internal diameter of the hollow column is 3/4 of the external diameter. The columns have the same length and are pinned at the ends.

12

UNIT - III

3 A cantilever truss is shown in Fig. 2 below. Find the magnitude and nature of forces in the members 3-4, 4-7, 4-6 and 6-7 using method of sections.

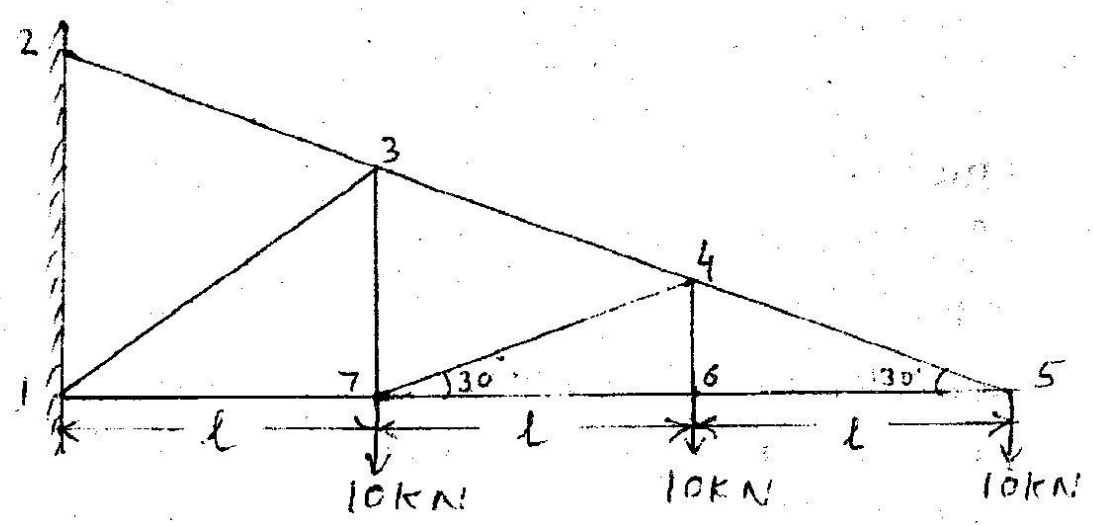


Fig. 2

16

OR

3 Determine the moment of inertia of the Z-section shown in **Fig. 3** below, about *xx* and *yy* axes, where *xx* and *yy* are the axes passing through the centroid of the figure.

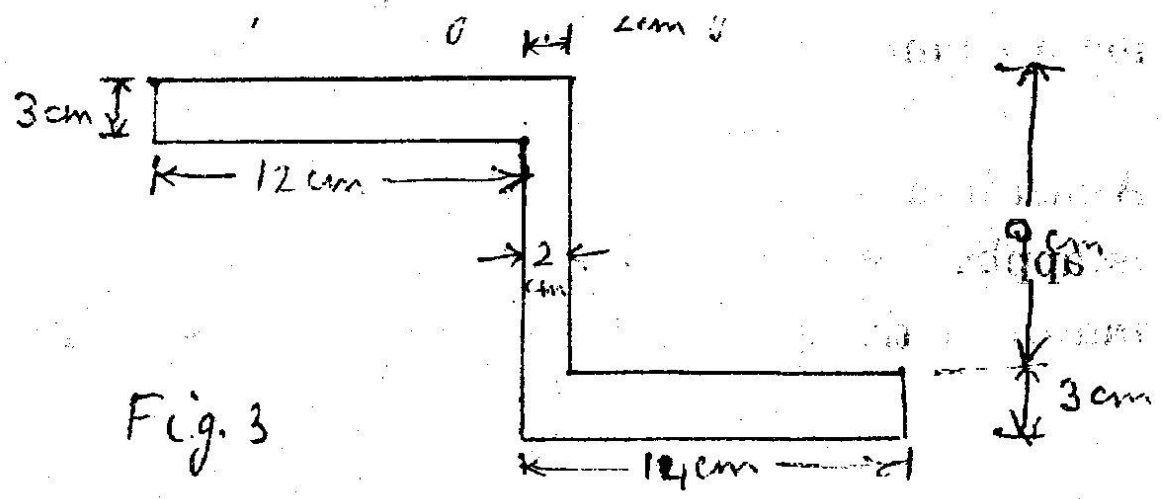


Fig. 3

8+8=16

UNIT-IV

4 (i) Draw the shear force and bending moment diagrams for a cantilever beam of span *l*, supporting a uniformly distributed load of intensity W kN/m over its half span starting from the free end.

8

(ii) Draw the shear force and bending moment diagrams for a simply supported beam as shown in Fig. 4 below. Calculate the values at the salient points.

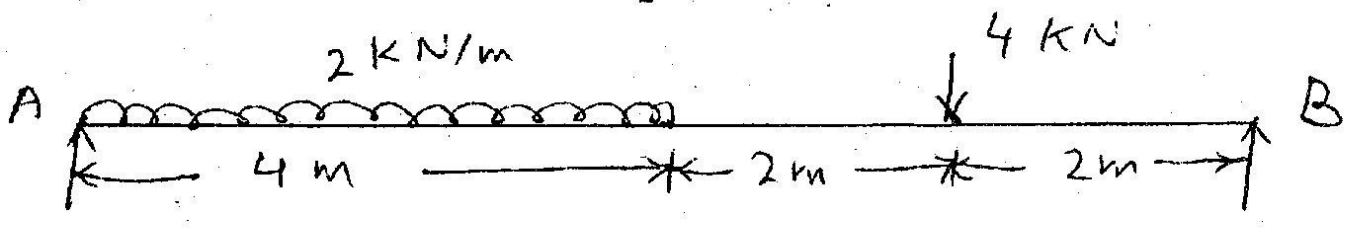


Fig. 4

8

OR

4 A beam of 8.5m long, rests on supports 5m apart, the right hand end overhanging its support by 2m, and the left hand end by 1.5 m. The beam carries a uniformly distributed load of 5 kN/m between the supports only. The beam also carries a point load of 6 kN at the extreme right hand end and a point load of 4 kN at the left hand end. Construct the shear force and bending moment diagrams stating the values at salient points. Give the positions of the points of contraflexure on the beam.

16

UNIT-V

5 (i) Define Shear Centre. How will you calculate the shear centre for a channel section ?

3+3=6

(ii) A cast iron cantilever of length 2m fails when a load of 2000N is applied at the free end. Determine the bending stress at failure if the section of the cantilever is 20mm x 60 mm.

10

OR

5 (i) Explain unsymmetrical bending briefly.

6

(ii) A beam of I section has flanges 12 cm wide and 2 cm thick and web 1 cm thick. Total depth of I-Section is 30 cm. Compare its flexural strength with that of a beam of rectangular section of same weight, the depth being twice the width.

10