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BICE-008

B.Tech. CIVIL ENGINEERING (BTCLEVI)

Term-End Examination

00542 **December, 2017**

BICE-008 : STRUCTURAL ANALYSIS – I

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. Assume any missing data suitably.*

1. (a) A bar ABCD as shown in Figure 1 is subjected to a pull of 4000 kN. The portions AB and BC are cylindrical whereas portion CD is square in section. Determine the stresses in the portions AB, BC and CD. Also find the total elongation of the bar ABCD. Take E = 200 kN/mm^2. 7

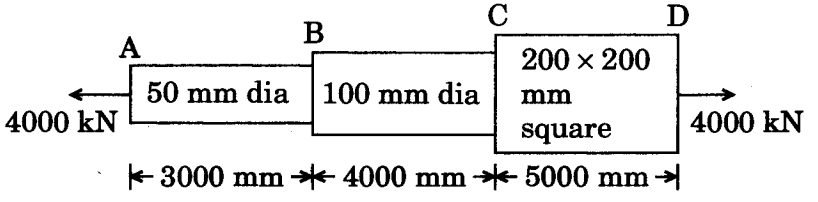

Figure 1

(b) A weight of 30 kN is supported by two brass rods and a steel rod, each 10 mm in diameter and symmetrically placed as shown in Figure 2. The original length of each rod is 1 m. Assume E for steel and brass as 205 kN/mm^2 and 102 kN/mm^2 respectively. Find the load carried by each rod. *7*

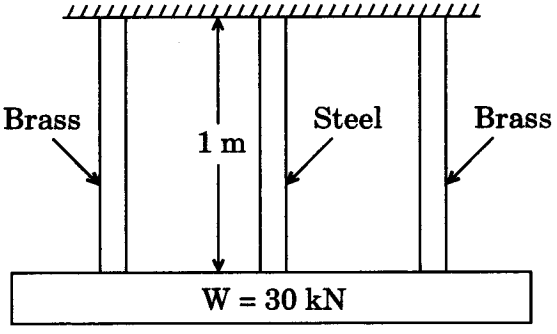

Figure 2

2. A beam is loaded as shown in Figure 3. Draw the B.M. and S.F. diagrams for the beam. *14*

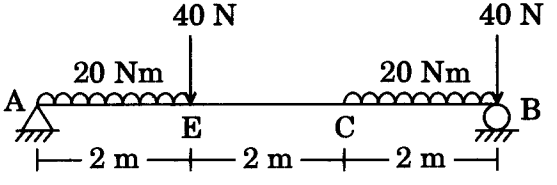

Figure 3

3. (a) What is the difference between bending stress and direct stress ? Discuss briefly with a neat sketch. *4*

(b) A rectangular beam, 100 mm wide and 200 mm deep, is used over a span of 4 m with a distributed load of 1500 N per metre run. Determine the

(i) maximum stress developed at a section 1 m from the right hand support,

(ii) position and magnitude of the maximum stress developed in the whole length of the beam. *10*

4. (a) What is the difference between a column and a strut ? *4*

(b) A hollow steel tube of 20 cm external diameter and 1 cm thick is 4 m long. It is used as a stanchion. If E for the tube material be 2×10^4 kN/cm^2, determine the safe buckling load for the stanchion if

(i) both ends of the stanchion are fixed, and

(ii) one end is fixed and the other end is hinged.

Take factor of safety = 4. *10*

5. (a) A hollow circular steel shaft of external diameter 50 mm and internal diameter 30 mm is subjected to a torque of 1 kNm. Determine the

(i) maximum and minimum shear stresses developed in the shaft,

(ii) angular twist over 1 m length of the shaft, and

(iii) shear stress at a radius of 20 mm.

The shear modulus G may be taken as 84 kN/mm^2. *7*

(b) Discuss the concept of residual stresses briefly. 7

6. Write short notes on the following topics : $4 \times 3\frac{1}{2} = 14$

(a) Shear Centre

(b) Middle Third Rule

(c) Assumptions in Euler's Theory

(d) Non-Destructive Testing

7. An I-section beam of flanges 20 cm × 2 cm and web 30 cm × 1 cm is acted on by a shearing force of 150 kN. Determine

(a) the maximum and minimum shearing stress in the web,

(b) the maximum shear stress in the flange,

(c) the shearing stress at a layer 6 cm below the top of the section.

Show the above stresses in the stress distribution diagram. 14