INTERNATIONAL CENTRE FOR APPLIED SCIENCES
MAHE, MANIPAL

B.Sc. (Applied Sciences) in Engg.

End – Semester Theory Examinations – May 2021

II SEMESTER – STRENGTH OF MATERIALS (IME123)

(BRANCH: MECHANICAL & AVIATION)

Time: 3 Hours **Date: 20 May 2021** **Max. Marks:50**

- ✓ **Answer ALL questions**
- ✓ **Missing data, if any, may be suitably assumed**

1A Answer the following: **(5)**

a. Define volumetric strain
b. What is factor of safety? Write its importance
c. What are the differences between thin and thick cylinders?
d. Draw the stress strain curve for mild steel material
e. Write the formula for torsional rigidity

1B For a cantilever beam of span L, subjected to a UVL of w/unit length throughout its span, find the shear force and bending moment at all salient points and draw SFD and BMD. **(5)**

2A Draw the SFD and BMD for a simply supported beam of length 9 m and carrying a UDL of 10 kN/m for a distance of 6 m from the left support. Also calculate the maximum bending moment on the beam section. **(5)**

2B The composite bar shown in figure is made of steel in portion AC and copper in portion CD. The two materials are rigidly joined at C. Find the extension of the bar under the loading as shown in figure Q-2B. **(5)**
Take E(steel)= 2 x 10^5 N/mm^2 and E(copper)= 1.1 x 10^5 N/mm^2

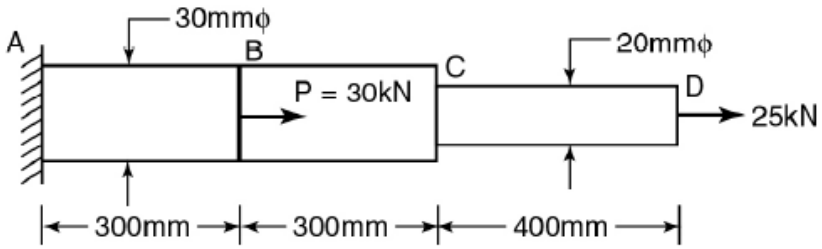

Figure Q-2B

3A Determine the deflection at mid span for a loaded beam as shown in figure Q-3A. Take E=2 x 10^5 N/mm^2 and I=4.3 x 10^8 mm^4. Use Macaulay's method. **(5)**

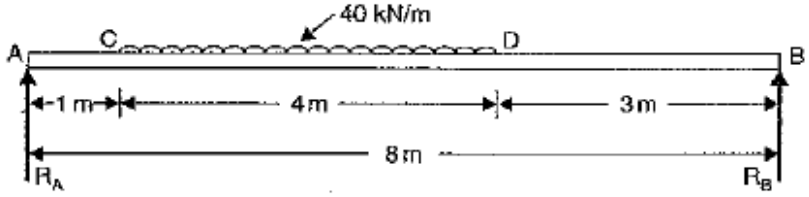

Figure Q-3A

3B An I-section beam as shown in figure Q-3B, is simply supported over a span of 12 m. If the maximum permissible bending stress is 80 N/mm^2, what concentrated load W can be carried at a distance of 4 m from right support? **(5)**

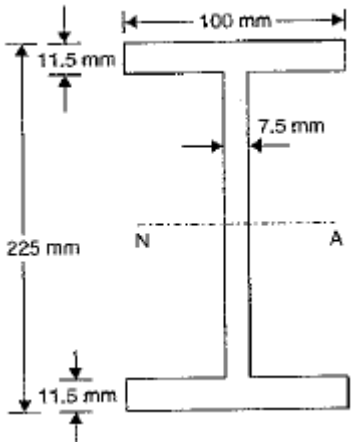

Figure Q-3B

4A Derive the equation for central deflection and slope at any one end for a simply supported beam subjected to concentrated load W at the mid span by using double integration method. **(5)**

4B Determine Euler's crippling load for an I-section joist 40 cm x 20 cm x 1 cm and 5 m long which is used as a strut with both ends fixed. Take E = 2.1 x 10^5 N/mm^2 for the joist. **(5)**

5A A steel tube of 200 mm external diameter is to be shrunk on to another steel tube of 50 mm internal diameter. The diameter at the junction after shrinking is 120 mm. Before shrinking on, the difference of diameters at the junction is 0.08 mm. Calculate the radial pressure at the junction and the hoop stresses developed in the two tubes after shrinking on. Take E as 2 x 10^5 N/mm^2. **(5)**

5B A hollow shaft of diameter ratio 3/8(ID/OD) is to transmit 375 kW power at 100 rpm. The maximum torque being 20% greater than the mean. The shear stress is not to exceed 60 N/mm^2 and twist in a length of 4 m not to exceed 2 degrees. Calculate its OD and ID which would satisfy both the above conditions. Assume modulus of rigidity as G= 0.85 x 10^5 N/mm^2. **(5)**

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