INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)

End Semester Examination Dec 2019/Jan 2020

B.Tech (Marine Engineering)

Semester- II

Strength of Materials I

(UG11T3204)

Date: 08.01.2020 **Max Marks: 70**

Time: 3 Hours **Pass Marks: 35**

Part – A (compulsory)

Answer the following (10x2=20 Marks)

[This may contain problems or few descriptive type questions or one mark questions or combinations]

1 State the principle of superposition.

2 Define the term modulus of resilience.

3 State Hooke's Law clearly.

4 What is statistically indeterminate structure? Explain with diagram.

5 Write down the relation between Young's modulus, Bulk modulus and Poisson's ratio.

6 Define Poisson's ratio. What is the range of the value of Poisson's ration.

7 What do you understand by the term, 'point of contraflexture'?

8 Define Neutral axis is a beam.

9 Write the assumptions for finding out the shear stress in a circular shaft, subjected to torsion.

10 Define "Shear Stress".

Part – B

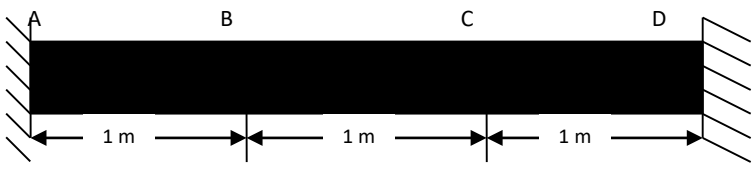
Answer any 5 out of 7 questions (5 x 10= 50 marks)

11 a) Define modulus of elasticity.

b) Find the expression of deformation of a body to self weight.

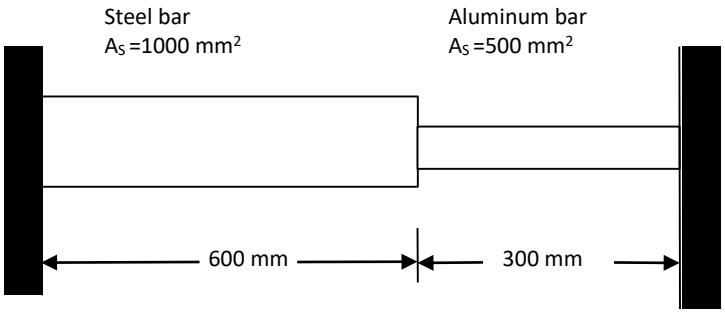
c) A load 0f 5kN is to be raised with the help of a steel wire. Find the minimum diametre of the steel wire, if the stress is not to exceed 100 Mpa. (2+4+4=10)

12 An aluminum bar 3m long and 2500 mm^2 in cross-section is rigidly fixed at A and D as shown in Figure.



Determine the loads sheared and stresses in each portion and the distances through which the points B and C will move. Take E for aluminum as 80 GPa. (10)

13 A composite bar made up of aluminum and steel, is held between two supports as shown



The bars are stress free at a temperature of 38° C. What will be the stress in the two bars, when the temperature is 21°C, if (a) the supports are unyielding; (b) the supports come nearer to each other by 0.1 mm? (Assume the change of temperature is uniform all along the length of bar)

Take E for steel as 200 GPa; E for aluminum as 75 Gpa and coefficient of expansion for steel as 11.7 × 10^{-6} per °C and coefficient of expansion for aluminum as 23.4 × 10^{-6} per °C.

(10)

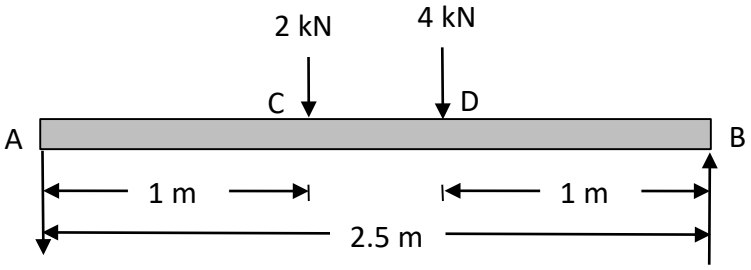
14 a) Deduce the relation between Modulus of Elasticity and Modulus of Rigidity.

b) A solid steel shaft has to transmit 100 kW at 600 r.p.m. Taking allowable shear stress as 70 MPa, find the suitable diameter of the shaft. The maximum torque transmitted in each revolution exceeds the mean by 20 %.

(5+5=10)

15 a)Draw the S.D.F (shear force diagram) and B.M.D (bending moment diagram) for a cantiliver beam with uniformly distributed load.

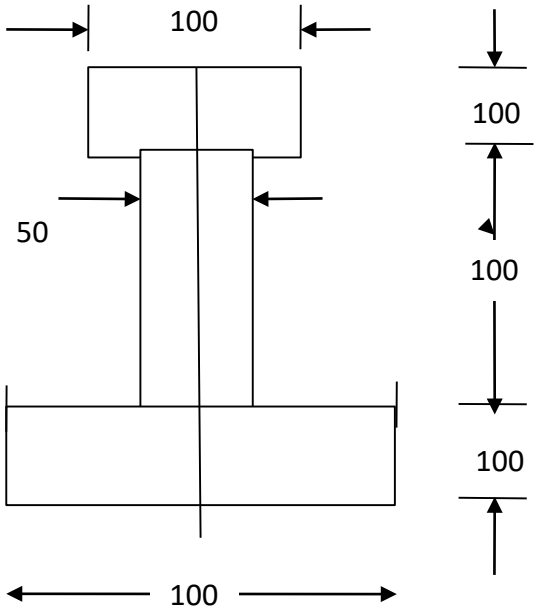
b) A simply supported beam AB of span 2.5 m is carrying two point loads as shown in the figure below.



Draw the shear force and bending moment diagram for the beam. (5+5=10)

16 a) Prove that $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$ (all the expressions are as per convention)

b) Figure shows a rolled steel beam of an unsymmetrical I-section. (All dimensions are in mm)



If the maximum bending stress in the beam section is not to exceed 40 MPa, find the moment, which the beam can resist. (5+5=10)

17 a) Write advantage and disadvantages of welded joints.

b) A cylindrical thin drum 800 mm in diameter and 4 m long is made of 10 mm thick plate. If the drum is subjected to an internal pressure of 2.5 MPa, determine its changes in diameter and length. Take E as 200 GPa and Poisson's ratio as 0.25. (5+5=10)

****