INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)

May/ June 2017 End Semester Examinations

B.Tech. (Marine Engineering) Second Semester

(AY 2009-2014 batches)

Strength of Materials – I (UG11T1204/ UG11T2204)

Date : 17.06.2017 Maximum Marks: 100

Time: 3 Hrs Pass Marks : 50

Part – A (10 x 3=30 marks)

(All questions are compulsory)

1. a) Define True stress & True strain
   b) An alloy specimen has a modulus of elasticity of 120 GPa and modulus of rigidity of 45 GPa. Determine the Poisson's ratio of the material.
   c) Explain the term Strain Energy.
   d) Define point of inflexion.
   e) Write the Bending stress equation and name the terms used in it?
   f) Find the expressions for the modulus of section for Rectangular section
   g) Define the term circumferential stress & longitudinal stress.
   h) Find the expressions for the Torsional section modulus for solid circular shaft.
   i) A close-coiled helical spring is required to carry a load of 150 N. If the mean coil diameter is to be 8 times that of wire, calculate these diameters. Take maximum shear stress as 100 MPa
   j) What are the advantages of welded joints?

Part-B (5x 14=70 marks)

(Answer any 5 of the Following)

2. (a) A brass bar having cross-sectional area of 1000 mm^2 is subjected to axial forces shown in the figure 1. Find the total elongation of the bar.

   Take E for brass=100 GN/m^2 (8 marks)

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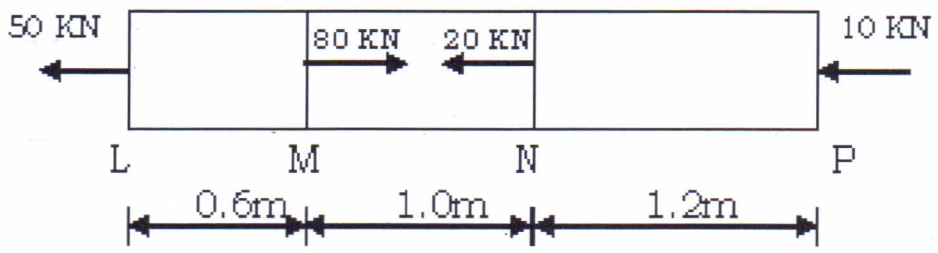

Fig. 1

(b) Draw a stress strain diagram for a ductile material and show all the points on them. Explain any one of these. (6 marks)

3. A steel bar 3 m long and 2500 mm^2 in area hangs vertically, which is securely fixed on a collar at its lower end. If a weight of 15 KN falls on the collar from a height of 10 mm, determine the stress developed in the bar. What will be the strain energy stored in the bar? Take E= 200 GPa. (14 marks)

4. The beam is supported & loaded as shown in figure 2. Draw Shear Force & Bending Moment diagrams indicating all important values. (14 marks)

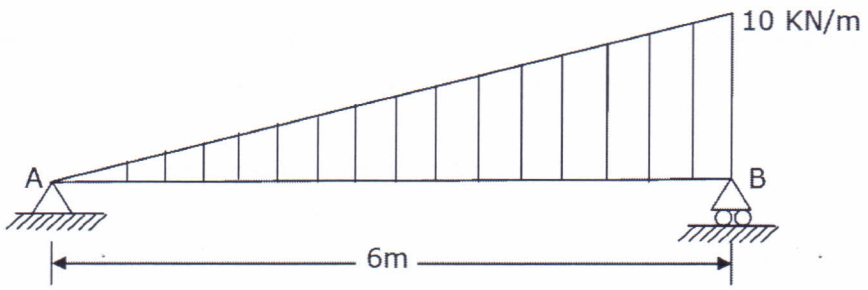

Fig.2

5. A cylindrical vessel whose ends are closed by means of rigid flange plates is made of steel plate 3mm thick. The internal length & diameter of vessel are 50cm and 25cm respectively. Determine the longitudinal and circumferential stresses in the cylindrical shell due to an internal fluid pressure of 3 MN/m^2 .Also calculate increase in length, diameter and volume of the vessel. Take: E=200 GN/m^2, and μ= 0.3. (14 marks)

6. a) State the assumptions made in the theory of simple bending. (4 marks)

b) Derive the expression for the bending stress and the radius of curvature for a straight beam subjected to pure bending.(10 marks)

7. A solid circular shaft transmit 75 KW power at 200 rpm.Calculate the shaft diameter, if the twist in the shaft is not to exceed 1^0 in 2 meters length of shaft, shear stress is limited to 50 MN/m^2.Calculate the maximum external diameter satisfying these conditions. Take G= 100 GN/m^2. (14 marks)

8. a) Find the expression for strain energy stored in a body due to torsion. (6 marks)

b) Derive an expression for closely-coiled helical springs subjected to an axial load. (8 marks)

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