

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
Time: 3 Hrs

Maximum Marks: 100
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 mm² is subjected to axial forces shown in the figure 1. Find the total elongation of the bar.
Take E for brass=100 GN/m² (8 marks)

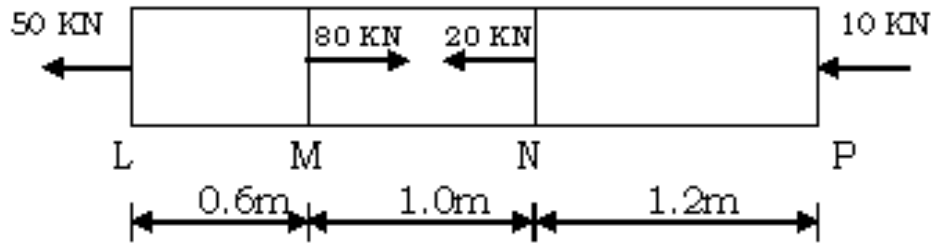


Fig. 1

(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 $E = 200 \text{ GPa}$. (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)

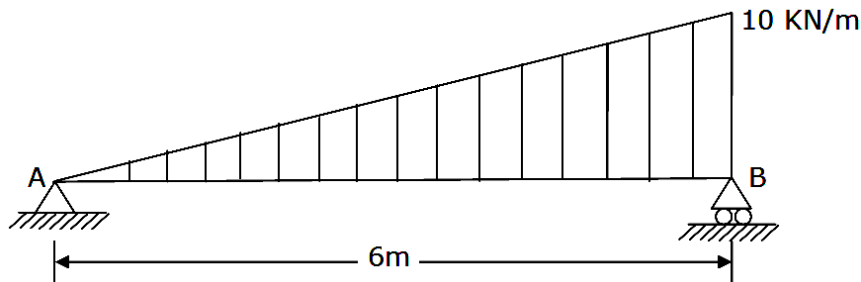


Fig.2

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: $E = 200 \text{ GN/m}^2$, and $\mu = 0.3$. (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° in 2 meters length of shaft, shear stress is limited to 50 MN/m^2 . Calculate the maximum external diameter satisfying these conditions. Take $G = 100 \text{ GN/m}^2$. (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)
