Assignment No: 05
Date: 11/09/2018

SIMPLE STRESSES & STRAINS

Sub Code 2130003 **Title of Subject** Mechanics Of Solids

#	Questions
1.	Define Modulus of Elasticity, Poisson's ratio, Modulus of Rigidity, shear strain, volumetric strain and Bulk Modulus.
2.	Explain Homogenous Material, Composite Element and prismatic Element.
3.	Sketch the Characteristic Stress - Strain curve for mild steel under tension and show salient points on it.
4.	Explain yield stress, ultimate stress and breaking stress with neat sketch for M.S specimen when subjected to tensile loading.
5.	Derive the relation between bulk modulus and modulus of elasticity.
6.	Determine the compressive stress developed in a punch of 10 mm diameter, used to make a hole of 10mm diameter in 8mm thick mild steel plate. The shear strength of mild steel is 300MPa.
7.	A member is formed by connecting end to end a 300mm long steel bar of 50 mm X 50 mm square section with 300 mm long aluminum bar of 100 mm X 100 mm square section as shown in **Figure – 1**. Determine the axial push required to produce the total decrease in length of 0.2 mm. Take $E_{Steel} = 2 \times 10^5$ MPa and $E_{aluminum} = 0.7 \times 10^5$ MPa.
8.	A stepped bar made of steel, copper and brass is under axial force as shown in F**igure – 2** and is in equilibrium. The diameter of steel is 12mm, diameter of copper is 16mm and the diameter of brass is 20 mm. Determine (i) Magnitude of unknown force P (ii) stresses in each material and (iii) Total change in length of the bar. Take E_{steel} = 200GPa, E_{copper} = 100GPa and E_{brass} = 80GPa
9.	A bar ABC is loaded as shown in **Figure - 3**, in which portion AB is of uniform section and portion BC is of tapering section. Calculate the value of load **"P"** so that the total deformation is 0.3 mm. Neglect the deformation due to self weight. Calculate the change in volume of portion AB. Take E= 110 GPa and 1/m=0.25.
10.	A wire is tied straight between two rigid poles 10 m apart has initial tensile stress 10 N/mm^2 at 32° C. Calculate stress in wire if temperature reduces to minus 8° C. Take E = 75 X 10^5 N/mm^2 and $\alpha = 20 \times 10^{-6}$/°C.

11.	A rectangular block of size 300 X 150 X 100 is subjected to forces as shown in **Figure – 4.** If E = 75 GPa and Poisson's ratio is 0.25, calculate (i) Change in volume (ii) Modulus of rigidity and (iii) Bulk modulus.
12.	A steel rod of 30 mm diameter is placed inside a copper tube of external diameter 50 mm and internal diameter 40mm, having length equal to 500 mm and connected rigidly at the ends as shown in **Figure - 5**. The bar is subjected to axial pull of 150 kN. Find the stresses in each material and elongation of the composite bar. Take Esteel = 200 GPa and Ecopper = 100GPa.

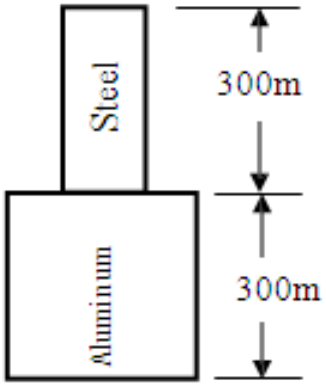

Figure - 1

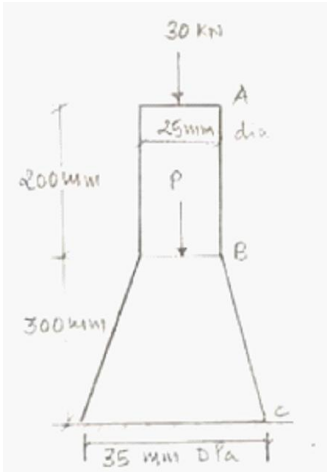

Figure – 3

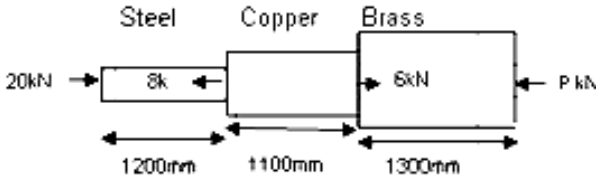

Figure - 2

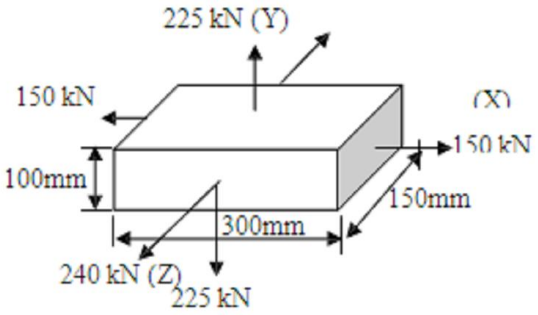

Figure – 4

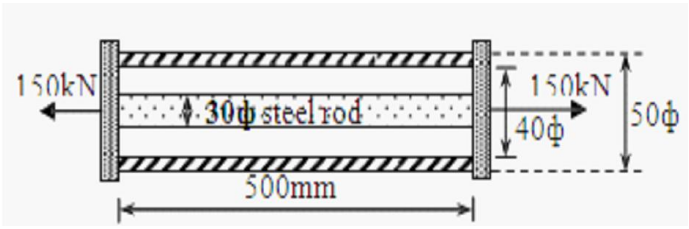

Figure - 5

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APPLIED MECHANICS DEPARTMENT

Assignment No:	**06**	**PRINCIPLE STRESSES**	
Date:	**11/09/2018**		
Sub Code	**2130003**	**Title of Subject**	**Mechanics of Solids**

#	Questions
1.	What are principal planes and principal stresses?
2.	Define the terms Complementary shear stress, Resultant stress, Angle of obliquity.
3.	Plot Shear stress distribution diagram for I-section, T-section, H-section, Rectangular section, Circular section
4.	For the element shown in the following **Figure – 1**, find the normal stress, tangential stress and resultant stress on the plane AB. Also, find principal stresses and principal planes. Use any method.
5.	A point in two dimensional stressed body is shown in **Figure - 2**. Determine the magnitudes and directions of principal stresses, using analytical method.
6.	For the infinitesimal element shown in the **Figure - 3**, find the normal stress, tangential stress and resultant stress on the plane AB.

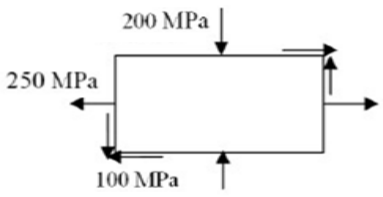

Figure – 1

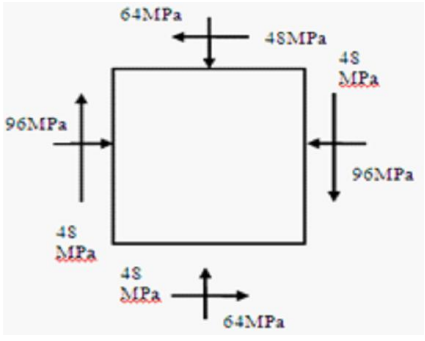

Figure – 2

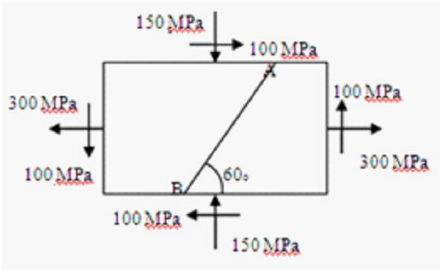

Figure – 3