PRN:		Course Code :	UME301

Second Year **B. Tech** End Semester Examination Winter 2023

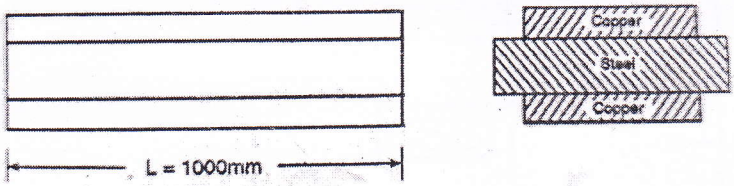
Strength of Materials

Day and Date: Tuesday, 28/11/2023 Max Marks: **50**

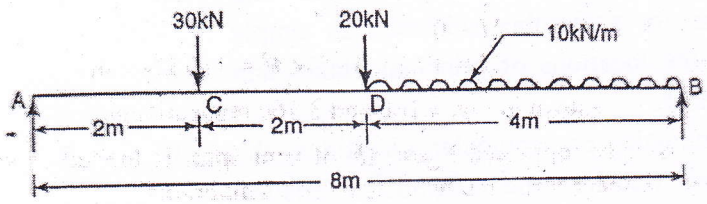
Time : 10:30 am to 12:30 PM Duration: **02** hrs

Instructions: All questions are compulsory.

Q.1	**Attempt any two from the following**	Marks	Bloom's Level	CO
a)	Define stress and strain. Explain the stress-strain curve for a typical material.	06	1	1
b)	Describe the factors that influence the mechanical properties of materials, including temperature, microstructure, and loading conditions.	06	1	1
c)	A compound bar is made of a central steel plate 60 mm wide and 10mm thick to which copper plates 40 mm wide by 5 mm thick are connected rigidly on each side. The length of the bar at normal temperature is 1 meter. If the temperature is raised by 80°C, determine the stresses in each metal and the change in length. Take $E_s=2\times10^5$ N/mm^2, $E_c = 1\times10^5$ N/mm^2, $\alpha_s = 12 \times 10^{-6}$ /° C and $\alpha_c= 17 \times 10^{-6}$ /° C	06	2	1

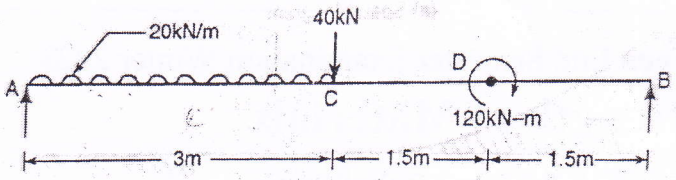


Q.2	**Attempt any two from the following**			
a)	Explain the process of drawing a Shear Force Diagram for a simply supported beam loaded with point loads and distributed loads.	06	1	2
b)	Draw the Shear force and bending moment diagrams for the following beams as shown below. And also locate the point of contraflexure, if any.	06	2	2



c)	Draw the Shear force and bending moment diagrams for the following beams as shown below. And also locate the point	06	2	2

of contraflexure, if any.



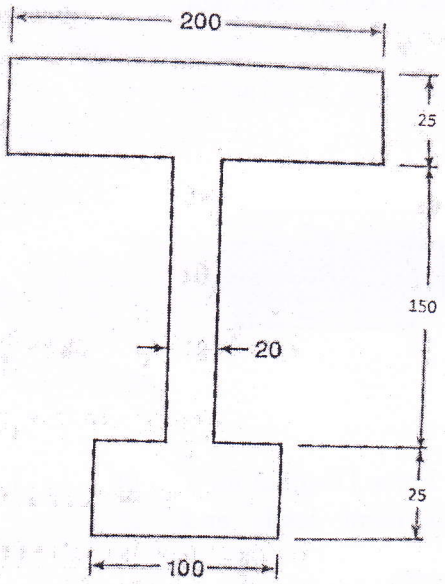
Q.3 **Attempt the following**

a) What are the assumptions made in simple theory of bending. Derive the flexure formula. 06 1 3

b) Explain the concept of pure bending and moment of resistance. 07 1 3

or

b) A simply supported beam of span 4m carries a central point load of 100kN. The beam is of I section of unequal flanges as shown in figure. Calculate shear stresses at neutral axis and also draw the shear stress distribution over the depth of section. 07 2 3



Q.4 **Attempt the following**

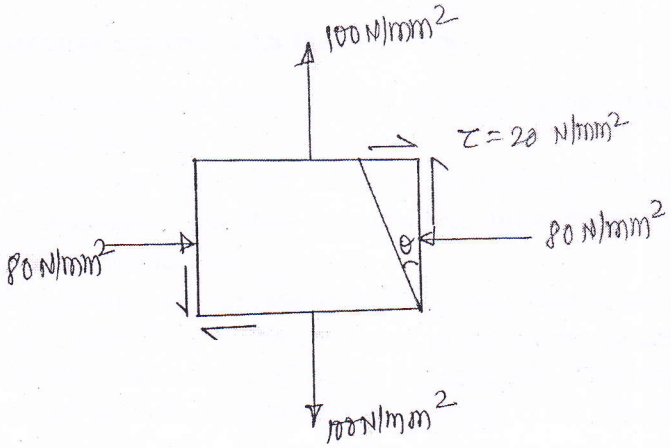
a) Derive the expression for the principal stresses and maximum shear stress for a member subjected to simple shear stresses. Show the locations of principal planes and planes of maximum shear. 06 1 4

b) At a point in two mutually perpendicular directions, the stresses are 80 N/mm^2 (tensile) and 40N/mm^2 (Tensile). Each of the above stress accompanied by shear stress of 60 N/mm^2. Determine analytically the normal stress, shear stress and resultant stress on an oblique plane inclined at an 07 2 4

angle of 45^0 with the axis of minor tensile stress.

or

b) At a point in a strained material a tensile stress of 100 N/mm^2 and compressive stress of 80 N/mm^2 acting on two mutually perpendicular planes and shear stress at 20 N/mm^2 acts along these planes. Determine normal, tangential and resultant stress on a plane inclined at 40^o with the plane of compressive stress. 07 2 4



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