ADAMAS UNIVERSITY PURSUE EXCELLENCE	**ADAMAS UNIVERSITY** **END-SEMESTER EXAMINATION : JANUARY 2021** (Academic Session: 2020 – 21)		
Name of the Program:	**B. Tech**	**Semester:**	III
Paper Title :	Mechanics of Materials	**Paper Code:**	EME42111
Maximum Marks :	40	**Time duration:**	03 hrs
Total No of questions:	08	**Total No of Pages:**	02
(Any other information for the student may be mentioned here)	Assumptions made if any, should be stated clearly at the beginning of your answer.		

Answer all the Groups

Group A

Answer all the questions of the following $5 \times 1 = 5$

1. **a)** What do you mean by deformable bodies?

b) Elastic modulus, E= 18 GPa for a metal and Poisson's ratio, $\vartheta = 0.25$. Calculate, Shear Modulus (G).

c) A steel bar of 5 mm is heated from 15° C to 40° C and it is free to expand. The bar Will induce which kind of stress. Give your comment.

d) Differentiate tensile stress and compressive stress.

e) Differentiate reaction force and resistance to deformation.

GROUP –B

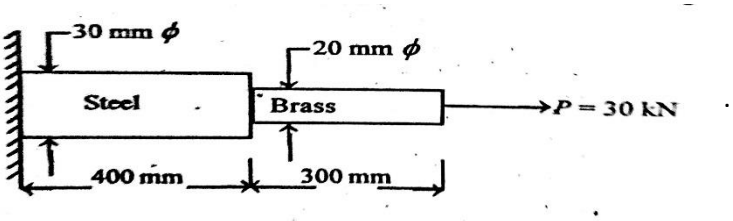
Answer *any three* of the following $3 \times 5 = 15$

2. Derive the Torsion equation $\frac{T}{J} = \frac{\tau}{r} = \frac{G\theta}{l}$ with usual notations.

3. What is meant by equivalent length of columns? What are its values for different end conditions of column?

4. Draw stress – strain diagram for a mild steel specimen, label and explain its significant points.

5. The composite bar shown in figure below is subjected to a tensile force of 30KN. The extension observed is 0.372 mm. find the Young's Modulus of brass, if Young's modulus of steel is $2x10^5$ N/mm^2.



GROUP –C

Answer *any two* of the following $2 \times 10 = 20$

6. **(a)** Calculate the maximum torque that a shaft of 125 mm diameter can transmit, if the maximum angle of twist is 1 degree in a length of 1.5m. Take G= 80000 N/mm^2.

(b) Determine the maximum deflection and slope for a cantilever beam of length (L)subjected to point load (W) at free end using Macaulay's Method.

7. **(a)** Derive the relation between load, Shear Force and Bending Moment.

(b) A 40mm by 50mm rectangular cross-section steel bar with pin-pin end condition is used to carry an axial compression load, if the proportional limit of the material is 230 MPa and E= 200GPa. Determine Minimum column length for which Euler's equation can be used.

8. Define: (a) Shear stress (b) Thermal stress (c) slenderness ratio (d) Toughness (e) Factor of safety