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## AU/ME-3002-CBGS

### B.E., III Semester

Examination, June 2020

### Choice Based Grading System (CBGS)

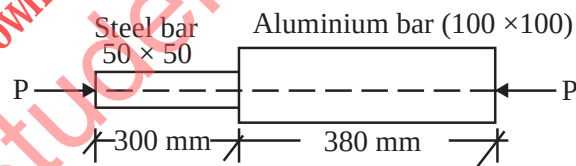
### Strength of Materials

Time : Three Hours

Maximum Marks : 70

- Note:** i) Attempt any five questions.  
ii) All questions carry equal marks.  
iii) Draw neat and clean sketches. Assume data suitably.

1. a) Derive from fundamental, the relation for the deformation of a body, when it is subjected to  
i) tensile force and  
ii) its own weight 7  
b) A member formed by connecting a steel bar to an aluminium bar as shown in fig. 7



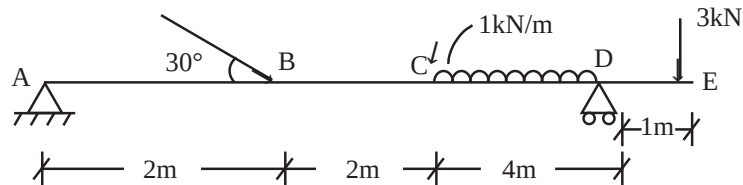
Assuming that the bars are prevented from buckling sidewise, calculate the magnitude of force P, that will cause the total length of the member to decrease by 0.25mm.  $E_S = 210 \text{ GPa}$   $E_A = 70 \text{ GPa}$

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2. a) Analyse the beam shown in fig and draw shear force diagram. 7



- b) Illustrate the term 'beam of uniform strength'. Explain its necessity. 7
3. a) Prove  $\frac{Z}{R} = \frac{c}{l} \theta$  in case of torsion of a circular shaft. 7
- b) Write the assumptions for finding out the shear stress in circular shaft, subjected to torsion. 7
4. a) A machine member is subjected to the following stresses  $\sigma_x = 150$  MPa,  $Z_{xy} = 24$  MPa. Find the equivalent stress as per the following theories of failure: 7
- i) Shear stress theory
- ii) Normal stress theory
- b) Explain any four theories of failure. 7
5. a) What do you understand by the term 'column' and 'strut'? Distinguish clearly between long columns and short columns. 7
- b) Describe the assumptions in the Euler's column theory. 7
6. a) Draw the Shear Force and Bending Moment diagram for a cantilever of length L carrying a point load W at the free end. 7
- b) State Maxwell's reciprocal theorem. 7

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7. a) Calculate: 7
- the change in diameter
  - the change in length of a thin cylindrical shell 100cm diameter 1cm thick and 5m long when subjected to internal pressure of  $3\text{N/mm}^2$ .  
Take  $E = 2 \times 10^5 \text{ N/mm}^2$ , Poisson's Ratio = 0.3.
- b) How will you use conjugate beam method for finding slope and deflection at any section of given beam. 7
8. Write short notes on: 14
- Flitched Beam
  - Principal Planes
  - Assumptions made in Lamé's theory
  - Thin Cylinders

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