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## AU/ME-221-CBCS

### B.E., III Semester

Examination, June 2020

### Choice Based Credit System (CBCS)

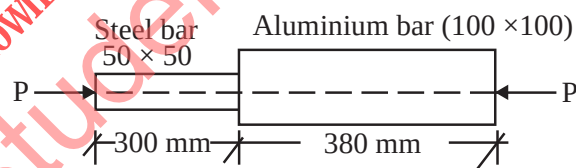
### Strength of Materials

Time : Three Hours

Maximum Marks : 60

- 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  
b) A member formed by connecting a steel bar to an aluminium bar as shown in fig.



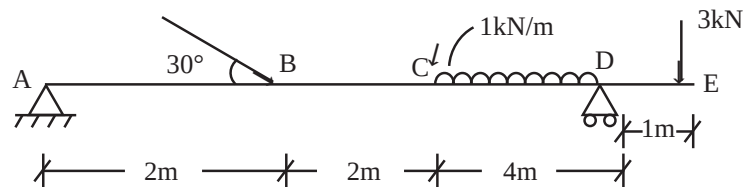
Assuming that the bars are prevented from buckling sidewise, calculate the magnitude of force P, that will cause the total length of the member to decrease by 0.25mm.  $E_S = 210 \text{ GPa}$   $E_A = 70 \text{ GPa}$

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



- b) Illustrate the term 'beam of uniform strength'. Explain its necessity.
3. a) Prove  $\frac{Z}{R} = \frac{c}{l} \theta$  in case of torsion of a circular shaft.
- b) Write the assumptions for finding out the shear stress in circular shaft, subjected to torsion.
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:
- Shear stress theory
  - Normal stress theory
- b) Explain any four theories of failure.
5. a) What do you understand by the term 'column' and 'strut'? Distinguish clearly between long columns and short columns.
- b) Describe the assumptions in the Euler's column theory.
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.
- b) State Maxwell's reciprocal theorem.

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7. a) Calculate:
- 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.
8. Write short notes on:
- Flitched Beam
  - Principal Planes
  - Assumptions made in Lamé's theory
  - Thin Cylinders

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