3E1210

Roll No. _____ [Total No. of Pages : 3

3E1210

B.Tech. III-Sem. (Main/Back) Examination, January- 2025

Automobile Engg.

3AE4-07 Mechanics of Solids

AE,ME

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used! calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1. Draw stress-strain curve for both Ductile and Brittle material.

2. Explain the following mechanical properties:

   a) Hardness

   b) Ductility

   c) Fatigue

   d) Creep

3. Define Poisson's ratio.

4. Define section modulus.

5. Explain the term torsional rigidity.

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6. Explain the term torosion and give general equation of torosion.

7. What is the buckling of columns?

8. Explain uniformly distributed load and uniformly varying load.

9. Differentiate between continuous and overhanging beam.

10. Explain thermal stresses and strain.

PART - B

(Analytical/Problem solving questions)

Attempt any Five questions. **(5×4=20)**

1. Find an expression for the total elongation of a bar due to its own weight when the bar is fixed at its upper end and hanging freely at the lower end.

2. A steel wire 2m. long and 3mm. in dia. Is extended by 0.75mm. when a weight w is suspended from the wire. If the same weight is suspended from a brass wire 2.5m long $2mm in dia, it is elongated by 4.64mm. Determine the modulus of elasticity of brass, if that of steel 2.0×10^5 N/mm^2.

3. What are the assumptions mode in the theory of simple bending?

4. Discuss in detail various Theories of failure.

5. Prove that neutral axis always passes through the Centroid of the cross-section.

6. Derive the expression for euler's buckling load for a column. with one end fixed and the other hinged.

7. Discuss the effective length of columns with different end conditions.

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PART - C

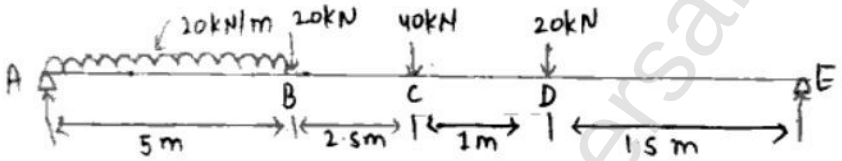
(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any Three questions. **(3×10=30)**

1. Derive the relation between modulus of elasticity, modulus of rigidity, bulk modulus and Poisson's ratio.

2. A mild steel rod of 25 mm. dia. And 400mm. long is enclosed centrally inside a hollow copper tube of external dia 35mm and internal dia 30mm. The ends of the rod are brazed together and the composite bar is subjected to an axial pull of 50 kN. Calculate the stress developed in the rod and tube. Also find the extension of the rod. Take E for steel as 200 GN/m^2, and that for copper as 150 GN/m^2.

3. Draw the S.F.D and B.M.D for the simply supported beam shown below:



4. A Cantilever of length of 2m carries a UDL of 1.5 kN/m run over the whole length and point load of 2kN at a distance of 0.5 m from the free end. Draw SFD and BMD. https://www.rtuonline.com

5. A Simply supported beam of uniform section has a span L and carries two equal loads w lock symmetrically plaud at a distance L/3 on either side of mid-span. Find the deflection at the mid span. Using macaulay's method.

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