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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

May 2023 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: Industrial Engineering and Management **Duration: 3 hrs.**
Course Code: 22IM3PCMAM **Max Marks: 100**
Course: Materials and Mechanics **Date: 08.05.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Define a Solid Solution. Discuss the Gibbs Phase Rule and Lever Rule. **10**

b) Describe the Iron Carbon Equilibrium Diagram using a neat sketch. Include all necessary details. **10**

UNIT - II

2 a) Explain the following terms used in Heat treatment process **10**
- Annealing
- Hardening
- Tempering

b) How are CMCs Manufactured? Explain using an appropriate sketch. **10**

OR

3 a) Describe the Pultrusion Process used in manufacturing Composites. **10**

b) What is meant by SOL-GEL process? Explain briefly. **10**

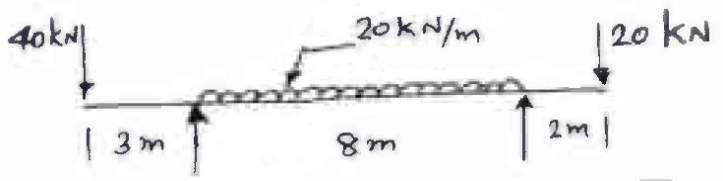
UNIT - III

4 a) A tension test conducted on a mild steel bar obtained the following data: **10**
Diameter of the bar = 18 mm
Gauge length =82 mm
Load at Proportional limit = 75 KN
Extension at load of 62 KN = 0.113 mm
Load at failure = 82 KN
Final Gauge length of the bar = 106 mm
Diameter of the bar at failure = 14 mm
Determine Young's Modulus, Proportional limit, true breaking stress, % elongation and percentage reduction in cross sectional area.

b) If a tension bar is found to taper from (D+a) diameter to (D-a) diameter, prove that the error involved in using the mean diameter to calculate the Young's modulus is $(10a/D)^2$percent. **10**

UNIT - IV

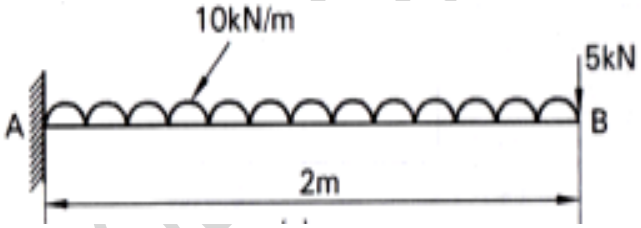
5 a) Draw the SFD and BMD for the beam shown in Fig. below, indicating values at important sections. Also find positions of i) Maximum Bending Moment ii) Maximum Shear Force and iii) Point of Contraflexture **10**



b) Show the relationship between load intensity, shear force and bending moment at any point in a beam. **10**

OR

6 a) Draw the shear force and bending moment diagram for the cantilever beam shown in the figure below. **10**



b) A wooden beam 10 m long, 360 mm deep and 300 mm wide is simply supported and loaded with uniformly distributed load for the entire length. Maximum stress intensity of the material is 60 MPa. Find the safe udl if factor of safety =6. **10**

UNIT - V

7 a) Write the assumptions made in the theory of pure bending and derive the relationship between bending stress, radius of curvature and bending moment. **10**

b) A rolled I section of size 50 mm x75 mm is used as a beam, with an effective span of 3 meters. The flanges are 5 mm thick and web is 3.75 mm thick. Calculate the uniformly distributed load the beam can carry if the maximum intensity of shear stress induced is limited to 40 MPa. **10**

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