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

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E. **Semester: III**
Branch: Industrial Engineering & Management **Duration: 3 hrs.**
Course Code: 19IM3DCMOM **Max Marks: 100**
Course: Mechanics of Materials **Date: 25.09.2023**

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

UNIT - I

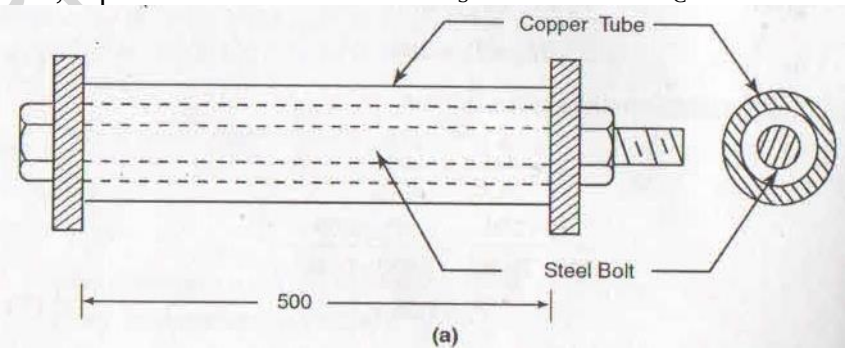
1 a) 1) Explain the Following with the help of formulae/sketches if any. **10**
a) Longitudinal Strain.
b) Lateral Strain.
c) Hooke's law.
d) Toughness.
e) Factor of safety.

b) The ultimate stress, for a hollow steel column which carries an axial load of 1.9MN is 480N/mm^2. If the external diameter of the column is 200mm, determine the internal diameter. Take the factor of safety as 4. **10**

OR

2 a) Derive an expression for Total Extension of the bars with continuously varying cross-section with usual notations. **10**

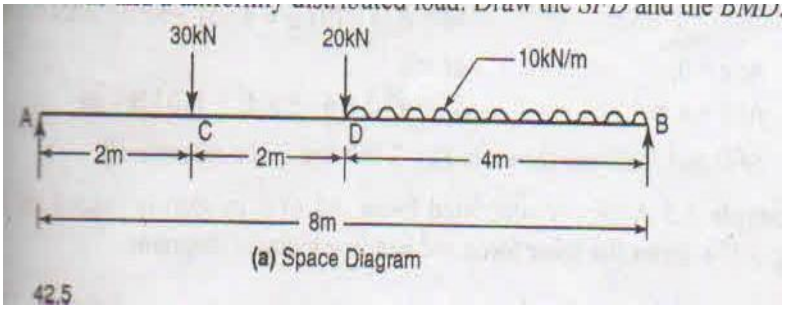
b) A steel bolt of 16mm diameter passes centrally through a copper tube of internal diameter 20mm and external diameter 30mm. The length of the whole assembly is 500mm. After tight fitting of the assembly, the nut is overtightened by quarter of a turn. What are the stresses introduced in bolt and tube, if pitch of nut is 2mm. Take E_S=200GPa and E_C=120GPa. **10**



UNIT - II

3 a) The simply supported beam shown in figure carries two concentrated loads and a uniformly distributed load. Draw the Shear force diagram and bending **10**

moment diagram.

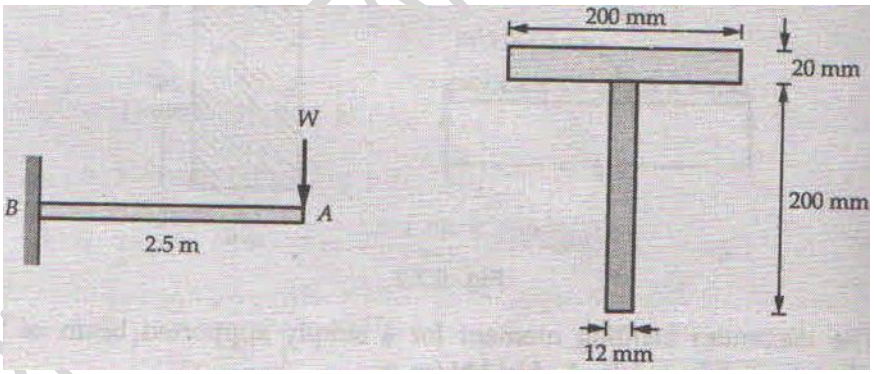


b) A simply supported beam of 7 m span with overhangs rests on supports which are 4 m apart. The left end overhanging is 2 m. The beam carries loads of 30 kN and 20 kN on the left and the right ends respectively apart from a uniformly distributed load of 25 kN/m between the supporting points. Draw the shear force and bending moment diagrams. Indicate the values on the diagrams. Also find the point of contraflexure if any. **10**

UNIT - III

4 a) What is pure bending? Mention the assumptions considered under pure bending theory. **06**

b) A beam of T section has a length of 2.5m and is subjected to a point load as shown in figure below. Calculate the compressive bending stress and plot the stress distribution across section of the beam. The maximum tensile stress is limited to 300MPa. Calculate the value of W. **14**



UNIT - IV

5 a) Define Solid Solution. Discuss the types of solid solutions. **8**

b) Two metals A and B melt at 600°C and 400°C respectively. They do not form any intermediate phases, but form a eutectic at at 65%A and 35%B at 300°C. The maximum solid solubility in each other is 4%, which remains the same until 0°C. **12**

i) Draw the phase diagram and label all the fields.

ii) Find the temperature at which an alloy of 20%A and 80%B starts and completes solidification.

iii) Find the temperature at which the same alloy is 50% solid and 50% liquid

OR

6	a)	Draw Iron-Iron Carbon Equilibrium diagram and label all phase fields. Explain any three invariant reactions in the diagram. Draw the microstructure of 0.8%carbon steel at different regions.	**12**
	b)	What is Heat treatment? Explain the objectives of Heat treatment	**08**

UNIT - V

7	a)	Define Composite materials. Give their classifications	**06**
	b)	Explain Fabre and laminated composites.	**06**
	c)	Explain the significance and applications of Nano Materials.	**08**

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