

Code No: 123BJ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, March - 2017

STRENGTH OF MATERIALS – I

(Common to CE, CEE)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

PART- A**(25 Marks)**

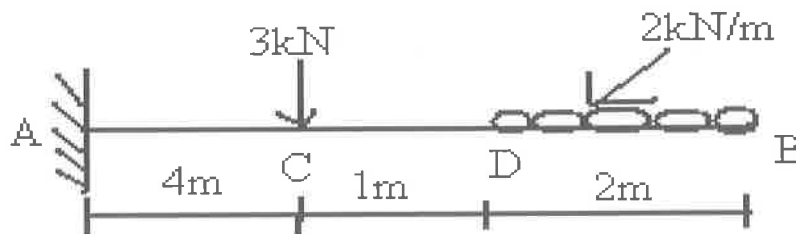
- 1.a) What do you mean by principle of super position? [2]
- b) Define different moduli. [3]
- c) Define Bending Moment and B.M.D. [2]
- d) Explain with neat sketches different types of beams. [3]
- e) Define shear stress and write the formulae for calculating this stress. [2]
- f) Write the assumptions in simple bending theory. [3]
- g) State "Rankine's theorem of failure". [2]
- h) Write the limitations of maximum shear stress theory. [3]
- i) Define moment area theorem II. [2]
- j) What is Macaulay's method and how this is different from double integration method of calculating slopes and deflections in a beam. [3]

PART-B**(50 Marks)**

- 2.a) Draw stress – strain diagram for mild steel, brittle material and a ductile material and indicate salient points.
- b) A circular alloy bar 3 m long uniformly tapers from 40mm diameter to 25mm diameter. Calculate the elongation of the rod under the axial force of 75kN. Take $E=140\text{GPa}$. [5+5]

OR

3. Define Resilience and derive the equation of stresses for a body subjected to sudden and impact loading. [10]
4. Draw S.F.D and B.M.D for the cantilever beam shown in figure 1. [10]

**Figure: 1****OR**

5. Draw S.F.D and B.M.D for the Over hanging beam shown in figure 2. [10]

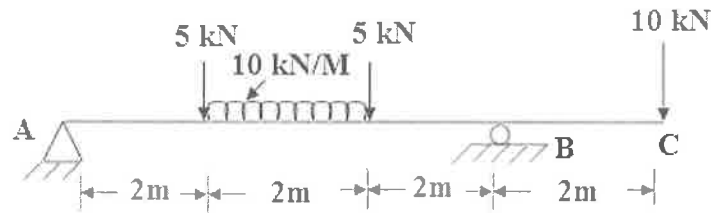


Figure: 2

6. A simply supported beam of span 8 m carries a udl of 15 kN/m over the entire span. If the maximum allowable stress due to bending is restricted to 175 N/mm^2 , determine the cross sectional dimensions if the section is:

- Rectangular with depth twice the breadth
- Hollow circular section having a diameter ratio of 0.7. [5+5]

OR

- Prove that for a rectangular section maximum shear stress is 1.5 times of average stress.
- Prove that for a Circular section maximum shear stress is 1.33 times of average stress. [5+5]

8. A rectangular block of material is subjected to a tensile stress of 120 N/mm^2 on one plane and a tensile of 45 N/mm^2 on a plane at right angles to the former. Each of the above stresses is accompanied by a shear stress of 60 N/mm^2 . Determine the principal stresses, principal planes and the maximum shear stresses. [10]

OR

- A Solid shaft is subjected to torque of 30 kN-m and bending moment of 15 kN-m. If the allowable stress is 165 Mpa, find the diameter of the shaft using:
 - Maximum stress theory
 - Maximum shear stress theory, Poisson's ratio is 0.3. [5+5]

- Derive the formulae used to find the slope and deflection of a beam by Moment-Area method.
- Using Moment area theorems find the values of slope and deflection for a cantilever beam of length 'L' subjected to Moment 'M' at the free end? [5+5]

OR

- A cantilever of length '4a' is carrying a load of W at the free end, and another load of W at its centre. Calculate the slope and deflection of the cantilever at the free end, using conjugate beam method. [10]

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