Code No: 133BE **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, April/May - 2018

MECHANICS OF SOLIDS

(Common to ME, MCT, AE, MIE, MSNT)

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) Explain about Elasticity and plasticity. [2]
b) Explain the Strain Energy and deduce the expression due to gradual loading. [3]
c) Draw the S.F.D and B.M.D of a cantilever carrying couple(M) at the free end. [2]
d) Derive the relation between load, shear force and bending moment. [3]
e) What is bending stress? Write pure bending equation. [2]
f) Draw the shear stress distribution for rectangular, hollow circular cross sections. [3]
g) What is Mohr's circle of stresses? [2]
h) Discuss in brief various prominent theories of failure. [3]
i) Explain about thin spherical shells? [2]
j) Derive the equations of longitudinal and circumferential stress. [3]

PART-B

(50 Marks)

2. Derive an expression for strain energy stored in a body when the load is applied with an impact. [10]

OR

3.a) The shear stress in a material at a point is given as 50N/mm^2. Determine the local strain energy per unit volume stored in the material due to shear stress. Take modulus of rigidity as 8×10^4 N/mm^2.
b) A load 'P' is suspended from two rods as shown in Figure 1. The rod AC is of steel, having a circular c/s 30mm in diameter, and an allowable stress of 160 MN/m^2;The rod BC is of Aluminium having diameter 40mm and allowable stress of 60 MN/m^2. What is the maximum load P which can be suspended from these rods? [4+6]

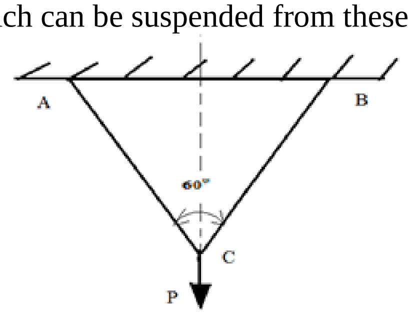

Figure: 1

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4. A horizontal beam 10m long carries a u.d.l of 180N/m over its entire span and in addition a concentrated load of 200N at the left end. The beam is supported at two points 7m apart, so chosen that each support carries half the total load. Draw S.F.D and B.M.D. [10]

OR

5. Calculate the reactions in the beam shown in Figure 2. Draw the SFD and BMD. Determine the location of maximum bending moment and mark it clearly on each of the diagrams. [10]

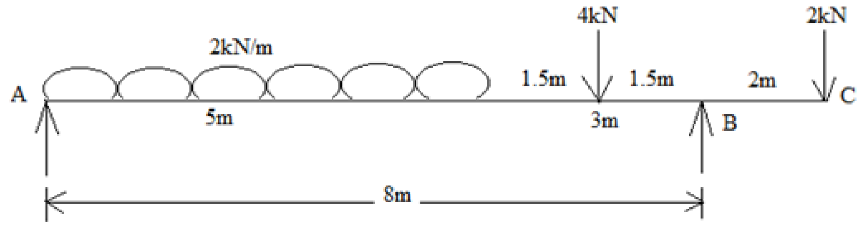

Figure: 2

6.a) What are the design criteria according to the bending and relation between the bending moment and section modulus?

b) What is bending stress? What is the difference between bending stress and direct stress? [6+4]

OR

7. A T-section beam shown in figure 3 is subjected to a shear force of 9KN at a section. Determine the amount of maximum intensity of shear stress and draw the distribution of shear stress across depth of the section. [10]

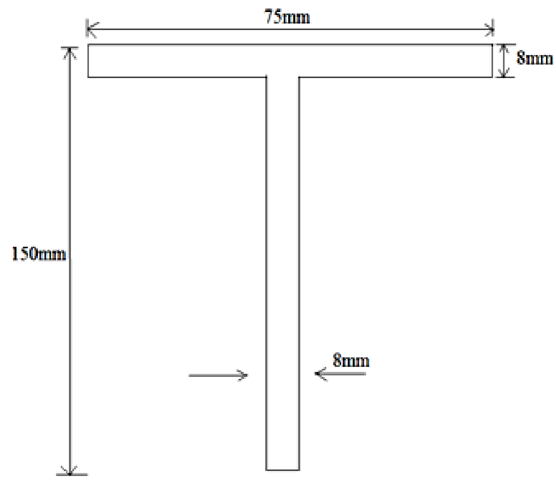

Figure: 3

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8. At a point in a strained material the principal stresses are 200 N/mm^2 (tensile) and 120 N/mm^2 (compressive). Determine the following stresses on an oblique section inclined at 40^0 with the axis of the minor principal stress:
a) Normal stress
b) Shear stress
c) Resultant stress(magnitude only)
d) Max. shear stress. [10]

OR

9. A certain type of steel has yield strength of 270 N/mm^2. At a point in a strained region, the principal stresses are +120, +80 and -30 N/mm^2. Determine the factor of safety as per the Max. Principal Strain Theory. Take Poisson's ratio is 0.285. [10]

10. Determine the diameter of a solid shaft which will transmit 300 KW at 250 rpm. The max. shear stress should not exceed $30N/mm^2$ and twist should not be more than 1^0 in a shaft length of 2.0m. Take modulus of rigidity=1×10^5 N/mm^2. [10]

OR

11. Derive the equations for the circumferential and longitudinal stresses induced in the thin spherical shells. [10]

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