TME-303 **78** Printed Pages : 4

Paper Code & Roll No. to be filled in your Answer Book

Roll No. | | | | | | | | | | | |

B. Tech. II Year (III Sem.)

Odd Semester Examination-2015

SOLID MECHANICS

Time : 3 Hours] *[Maximum Marks :100*

Attempt any Four (4×5=20)

1.1 Write definition of stress. Also define stress tensor.

1.2 A bar of cross section 850 mm^2 isacted upon by axial tensile force of 60 kN applied at each end of the bar. Determine the normal and sheering stresses on a plain inclined at 30° to the direction of loading.

1.3 State the complimentary property of sheer and prove its validity.

1.4 Write stress- strain relations for plain stress and plain strain.

1.5 A plain element is subject to the stress $\sigma_x = 82.74$ MPa and $\sigma_y = -82.74$ MPa. Determine analytically the maximum sheering stress existing in the element.

Answer Any Four (4×5=20)

2.1 Define isotropic and anisotropic materials.

2.2 Consider a carefully conducted experiment where an aluminum bar of 50 mm diameter is stressed in a testing machine as shown

in the figure. At a certain instant the applied force P is 100 kN, while the measured elongation of the rod is 0.219 mm in a 300 mm gaze length and the diameter's dimension is decreased by 0.01215 mm. Calculate the constant ν (Poisson's ratio).

2.3 Explain the failure of isotropic materials.

2.4 Draw the stress-strain curve for a typical ductile and brittle material.

2.5 Define the following material behaviors:

a) Homogeneous

b) Heterogeneous

c) Isotropic

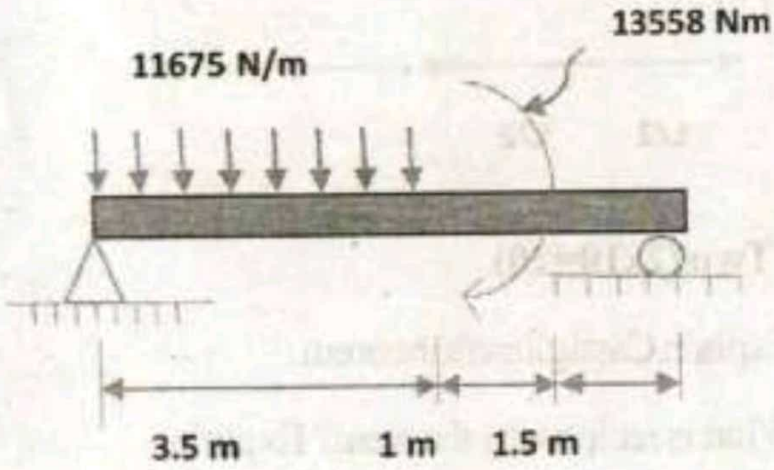
d) Transversely isotropic

e) Monolithic

Answer Any Two (2×10=20)

3.1 Derive relationships between load intensity, shearing force and bending moment at any point in a beam.

3.2 Find shearing force and bending moment at any point along the length of the beam. Also draw shearing force and bending moment diagram.



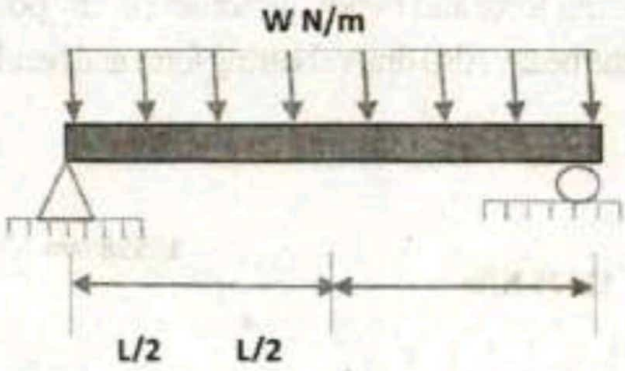
3.3 If a twisting moment of 1130 N m is impressed upon a 0.04445 m diameter shaft, what is the maximum shearing stress developed? Also what is the angle of twist in a 1.2192 m length of the shaft? The material is steel for which G = 82.74 GPa. Assume entirely elastic action.

Answer Any Two (2x10=20)

4.1 Abending moment M1 is applied at the free end of a cantilever of length L and of constant flexural rigidity EI. Find the equation of the elastic curve.

4.2 Explain the superposition procedure for determining elastic deflection of beams.

4.3 In a simply supported beam find the maximum deflection and rotation of the elastic curve at the ends caused by the application of a uniformly distributed loads of w N/ m. Flexural rigidity EI is constant.



Answer Any Two (2x10=20)

5.1 i) Explain Castigliano's theorem.

ii) What is reciprocity theorem? Explain.

5.2 Derive expressions for strain and energy due to axial torsion and bending shear.

5.3 Explain strain energy due to transverse shear.

—x—