PVP 14

Code: CE3T3

II B.Tech - I Semester–Regular/Supplementary Examinations
November 2018

MECHANICS OF SOLIDS-I
(CIVIL ENGINEERING)

Duration: 3 hours Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks

11x 2 = 22 M

1.

a) A circular rod 2 m long and 15 mm diameter is subjected to an axial tensile load of 30kN. Calculate the elongation of the rod if the modulus of elasticity of the material of the rod is 120 KN/mm^2.
b) Define volumetric strain and State the relationship between E,G, and K.
c) What do you mean by point of contraflexure? State its significance.
d) What is use of BMD and SFD?
e) What is meant by Moment of resistance? Explain how do you calculate it?
f) Mild Steel has more toughness than high-strength steel. Explain in term of strain energy.
g) What is Eccentric loading? Name situations where eccentric loading is encountered in Civil Engineering field?

h) Bring out clearly the difference between bending stress and torsional stresses.

i) If a shaft transmits 20KW of power at 200 rpm, what is torque generated?

j) What is structural function of a spring? State equation for deflection in close coiled helical spring subjected to axial load?

k) What is polar section modulus? Explain its significance.

PART – B

Answer any ***THREE*** questions. All questions carry equal marks.

3 x 16 = 48 M

2. a) A steel bar of uniform diameter of 40 mm is heated to 80^0C and then clamped at the ends with the help of two fixtures 4 m apart, and left to cool down to room temperature of 20^0 C at which temperature the distance between the fixtures was found to be 1mm shorter than that at 80^0C. Determine the stress in the bar when it has cooled down to room temperature and the reaction at the fixtures.
E= 200 GN/m^2 and
Coefficient of thermal expansion= $1.1x10^{-5}$/deg.C.

8 M

b) A copper rod of diameter 20 mm is enclosed within a steel tube of 30 mm internal diameter and thickness 2 mm. The assembly is attached to rigid plates at the ends and is subjected to a tensile load of 28 KN. Find the stresses in the

rod and the tube if E= 200 GPa for steel and 120 GPa for copper. 8 M

3. a) List out different types of loadings acting on a beam. Explain each of type of loading with practical examples. 8 M

b) A simple supported beam has a span of 5m and carries a UDL load of 20KN/m in the left half and a UDL of 40 KN/m in the right half of its length. It also carries a point load of 30KN at the centre of the beam. Draw the SFD and BMD and find the position and magnitude of maximum BM in the beam. 8 M

4. a) Derive the bending equation. State its typical assumptions. 8 M

b) A T section is made up of two planks of wood 300mm x 20mm and 200 mm x 20 mm, with the larger of the planks kept horizontal. If the permissible stresses in tension and compression are 8 N/mm^2 and 12 N/mm^2, find the maximum BM it can carry as a simply supported beam with the flange on top. 8 M

5. a) State the assumption made in deriving the equation for shear stress distribution. 8 M

b) A hollow circular section of outside diameter 200 mm and thickness 10 mm carries an SF of 25 KN. Find the maximum shear stress and the shear stress at the inner edge and draw the shear stress distribution diagram. 8 M

6. a) Find the maximum power transmitted by a shaft at 200 rpm without exceeding the permissible stress of 100 MPa if the shaft is a solid circular shaft of diameter 60 mm. 8 M

b) A close coiled helical spring made of round steel wire is required to carry a load of 800N for a max stress not to exceed $200N/mm^2$. Determine the wire diameter if the stiffness of spring is 10N/mm and the diameter of the helix is 80 mm. Calculate also number of turns required in the spring. Neglect the correction due to the spring index. Given G for steel $80KN/mm^2$. 8 M