KATIHAR ENGINEERING COLLEGE, KATIHAR

CIVIL ENGINEERING, 2nd Year (Semester-IV)

Subject: Introduction to Solid Mechanics **Max. Marks: 05**

Date of Submission: 31/03/2020 **Instructor: Prof. Rashid Mustafa**

Assignment-II

Q.1 A seamless pipe with 80 cm diameter carries a fluid under a pressure of 2 N/mm^2. If the permissible tensile stress is 100 N/mm^2, the minimum thickness of the pipe is

(a) 2 mm (b) 4 mm (c) 8 mm (d) 16 mm

Q.2 A thin cylinder shell of diameter d, length l and thickness t is subjected to an internal pressure p. What is the ratio of longitudinal strain to hoop strain in terms of poisons ratio ν is

(a) $\frac{\nu-2}{2\nu-1}$ (b) $\frac{1-2\nu}{2-\nu}$ (c) $\frac{2\nu-1}{2+\nu}$ (d) $\frac{\nu-2}{2\nu+1}$

Q.3 A horizontal shaft 12m in length is fixed at its ends (left fixed end is A and right fixed End B). When viewed from its left end axial couples of 50 kN-m clockwise and 75 kN-m counter clockwise act at 5m and 9m from the left end respectively. The fixed end couple at A is ----------kN-m and at B is ----------kN-m.

Q.4 A steel shaft is subjected to a torque of 2000 kg-m and a twisting moment of 1000kg-m. If the diameter of shaft is 10 cm then maximum principal stress is ---------- kg/cm^2, minimum principal stress is ----------kg/cm^2 and maximum shear stress is---------- kg/cm^2.

Q.5 A cylindrical piece of steel 80 mm diameter and 120 mm long is subjected to an axial compressive force of 50,000kg. What is the change in volume (in cm^3) of the piece if bulk modulus = 1.7 x 10^6 kg/cm^2 and poisons ratio = 0.3 is

(a) 0.1176 (b) 0.2156 (c) 0.2134 (d) 0.3124

Q.6 A simply supported beam of rectangular cross section of size 200 x 300 mm (deep) supports a uniformly distributed load of 6 kN/m over an effective span of 4.0 m. The value of maximum principal stress (in N/mm^2) is ---------- if the shear stress is 0.2 N/mm^2.

Q.7 A cantilever beam with circular cross section of radius 100 mm is subjected to a uniformly distributed load over the entire span. It is given that the deflected shape of the beam has a maximum curvature of 1.018592 x10^{-6} mm^{-1} and a maximum shear force of 1 kN. The value of loading intensity (in kN/m) is ---------- and span length is ----------m if E = 2 x 10^5 MPa.

Q.8 A simply supported rectangular beam of L carries a udl over its entire length. What the value of critical length at which the shearing stress is τ and bending stress(flexural stress) σ reach their allowable value simultaneously. The breadth of the beam section is b and the depth is d and shear force V (τ_{max} = 1.5 V/bd)

(a) 0.51 L (b) 0.191 L (c) 0.42L (d) 0.11 L

Q.9 The equation for the deflected shape of a beam carrying a uniformly distributed load (in kN/m) and simply supported at the ends is given below:

$$y = \frac{1}{EI}(-2x^3 + x^4/6 + 36x)$$

The value of load intensity in kN/m is ----------and the position where shear force is zero is ----------m

Q.10 The stresses in a flat steel plate in a condition of plane stress are:

σ_x = 10,000 N/mm^2, σ_y = -6,000 N/mm^2 and τ_{xy} = 8000 N/mm^2

The magnitude (in N/mm^2) and orientation (in degree) of the principal stresses in the plane of the plate are respectively

(a) 12313.7, -1313.7, 22.5 (b) 13313.7, -9313.71, 22.5

(c) 16613.7, -1232.7, 43.5 (d) 15513.6, -1234.6, 43.5

Q.11 A propped cantilever beam of length 4 m is subjected to UDL of 30 kN/m over the entire length of the span. If the flexural rigidity of the beam is 2 x 10^4 kN-m^2, the rotation at the propped support of the beam----------degree and the moment developed at the fixed support is (in kN-m) ----------

Q.12 A steel specimen of 12 mm diameter extends by 6.31 x 10^{-2} mm over a gauge length of 150 mm when subjected to an axial load of 10 kN. The same specimen undergoes a twist of 0.5^0 on a length of 150 mm over a twisting moment of 10 N-m. Using the above data the value of Young's modulus of elasticity ----------N/mm^2, bulk modulus ----------N/mm^2, Shear modulus----------N/mm^2 and poisons ratio----------

Q.13 A steel rod, circular in cross-section, tapers from 30 mm diameter to 15 mm diameter over a length of 600 mm. The value of elongation----------mm if it has a pull of 20 kN and young's modulus of elasticity is 200 kN/mm^2.

Q.14 The strain arrangement in a point are ε_x = 800, ε_y = -1000, ϕ_{xy} = -600 the value of normal strain ---------- and shear strain ----------, major principal strain---------- and minimum strain ----------

Q.15 A cantilever of length L in which uniformly distributed moment “M” kN-m over the entire span.The value of shear force at fixed support is ----------kN and bending moment at fixed support is----------kN-m.

Happy Learning and Be Safe