KATIHAR ENGINEERING COLLEGE, KATIHAR

CIVIL ENGINEERING, 2nd Year (Semester-IV)

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

Time Allotted: 90 Minutes **Instructor: Prof. Rashid Mustafa**

Test-II (Set-A)

Q.1 The ratio of Young's modulus to modulus of rigidity for a material having poisson's ratio 0.2 is

(a) 12/5 (b) 5/12 (c) 5/14 (d) 14/5

Q.2 Sets of principal stress acting at any point in a stressed body are given below

1. $\{\sigma, 0\}$ 2. $\{\sigma,\sigma\}$ 3. $\{\sigma,-\sigma\}$ 4. $\{\sigma, \sigma/2\}$

The correct sequence of the ascending order of intensity of the maximum shear stress induced by the above sets will be

(a)1,4,3,2 (b) 2,1,4,3 (c) 1,3,4,2 (d) 2,4,1,3

Q.3 A simply supported beam of uniform cross section is subjected to a maximum bending moment of 2.25 t-m. If it has rectangular cross section with width 15 cm and depth 30 cm , then the maximum bending stress induced in the beam will be

(a) 50 kg/cm^2 (b) 100 kg/cm^2 (c) 150 kg/cm^2 (d) 225 kg/cm^2

Q.4 A 600 mm long and 50 mm diameter rod of steel (E = 200 GPa, α = 12 x 10^{-6} / ^{0}C) is attached to unyielding supports. When the temperature is 30 ^{0}C there is no stress in the rod. After the temperature of the rod drops to -20 ^{0}C, the axial stress in the rod will be

(a) 24 MPa (Compressive) (b) 72 MPa (Compressive)

(c) 120 MPa (Compressive) (d) 144 MPa (Compressive)

Q.5 When the strain in a material increases with time under sustained constant stress, the phenomenon is known as ----------

Q.6 The simply supported beam X and Y have span L and 2L respectively. Beam X has a cross section of 1x1 units and beam Y has a cross section of 2 x2 units. These beams are subjected to concentrated loads W each at the centre of their spans. The ratio of the maximum bending stress (X to Y) in these beams is ----------

Q.7 A steel rod of circular section tapers from 2 cm diameter to 1 cm diameter over a length of 50 cm. If the modulus of elasticity of the material is $2x10^6$ kg/cm^2, then the increase in length under a pull of 3000 kg will be ----------cm

Q.8 In order to produce a maximum shearing stress of 75 MN/mm^2 in the material of a hollow circular shaft of 25 cm outer diameter and 17.5 cm inside diameter, the torque that should be applied to the shaft is ---------- kN-m

Q.9 A solid circular shaft is subjected to a bending moment M and twisting moment T. The ratio of maximum shearing stress to maximum bending stress is equal to

(a) 2T/M (b) T/2M (c) M/2T (d) 2M/T

Q.10 At a certain cross-section, a circular shaft 90 mm in diameter is subjected to a BM of 3 kN-m and twisting moment of 6 kN-m. The value of maximum principal stress (is in N/mm^2) --------

Q.11 The radius of the Mohr circle in a 2-D body having normal stress σ_x = -10 MPa, σ_y = -10 MPa and shear stress τ_{xy} = 8 MPa is

(a) 4 MPa (b) 6 MPa (c) 8 MPa (d) 10 MPa

Q.12 A solid shaft transmits 250 kW at 100 r.p.m. If the shear stress is not to exceed 75 N/mm^2, then the diameter of the shaft (is in mm) ----------

Q.13 In a tensile test, a test piece of 25 mm diameter is tested over a gauge length of 125 mm. The elongation over this length is 0.0875 mm under a pull of 68725 N. In a torsion test, a test piece was made of the same material and of same diameter, and it twisted 0.025 radians over a length of 250 mm at a torque of 0.3068 kN-m. The value of Poissons's ratio, young's modulus (N/mm^2), shear modulus (N/mm^2) and bulk modulus (N/mm^2) is

(a) 0.25, $2 x10^5$, $0.8 x10^5$ and $1.33 x10^5$ (b) 0.35, $2.2 x10^5$, $0.95 x10^5$ and $2.33x10^5$

(c) 0.45, $2 x10^5$, $1.8 x10^5$ and $0.33 x10^5$ (d) 0.15, $2.5 x10^5$, $0.6 x10^5$ and $1.66 x10^5$

Q.14 A simply supported beam has 6m span and the equation of bending moment (kN-m) is $3x^3$-4x. The value of shear force (in kN) is at the centre of the beam is ----------

Q.15 For an elastic metal which of the following relations can hold true

(a) E = N (b) N = K (c) E = K (d) E = N = K

Q.16 A 2m diameter water pipe is required to withstand a 200 m head of water. Assuming the limiting tensile stress for the pipe material to be 200 kg/cm^2, the minimum thickness of the material of the pipe to be used is ---------- cm

Q.17 A 4m long beam, simply supported at its ends, carries a point load 'W' at its centre. If the slope at the end of the beam is 1^0 then the deflection at the centre of the beam will be

(a) 10.56 mm (b) 18.32 mm (c) 23.27 mm (d) 39.37 mm

Q.18 A simply supported beam of rectangular cross section supports a point load at its mid span. If the width of the section is doubled, then the maximum deflection in the beam will be N times the deflection of the original beam. The value of N is----------

Q.19 A cantilever has rectangular cross-section and supports a concentrated load at its free end initially. If depth and width of the beam section are doubled, then the deflection at the free end of the cantilever is reduced to ---------- percentage of the initial deflection.

Q.20 A beam of rectangular section 100 mm x 300 mm carries certain loads such that the bending moment at a section A is M and at another section B it is (M+C). The distance between the sections A and B is 0.5 m and there are no external loads acting between the two sections. If the value of C is 10,000 N-m, then the maximum shear stress is ---------- N/mm^2.

< END OF THE QUESTION>

NOTE: Solution of class test-II will be uploaded on the college website **www.keck.ac.in**