KATIHAR ENGINEERING COLLEGE, KATIHAR
CIVIL ENGINEERING, 2nd Year (Semester-IV)

Subject: Introduction to Solid Mechanics **Instructor: Prof. Rashid Mustafa**

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Assignment-01

Q.1 A steel rod, circular in cross section, tapers from 30 mm diameter to 15 mm diameter over a length of 600 mm. Find how much its length will increase under a pull of 20 kN if young's modulus of elasticity = 200 kN/mm^2. Derive the formula used.

Q.2 Compare the strain energy of a beam simply supported at its end loaded with a uniformly distributed load with that of the same beam loaded with a central concentrated load and each having the same value of the maximum bending stress.

Q.3 A steel specimen of 12 mm diameter extends by 6.31×10^{-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, determine the elastic constants E, ν, N and K.

Q.4 The stresses in a flat steel plate in a condition of plane stress are:

$\sigma_x = 10{,}000$ N/mm^2 ; $\sigma_y = -6000$ N/mm^2 ; $\tau_{xy} = 8000$ N/mm^2

Find the magnitude and orientation of the principal stresses in the plane of the plate.

Q.5 A compound bar of consists of a circular rod of steel of diameter 25 mm, rigidly fitted into a copper tube of internal diameter 25 mm and thickness 2.5 mm. If the bar is subjected to an axial load of 100 kN, find the stresses developed in the two materials. Given, $E_s = 2 \times 10^5$ N/mm^2 and $E_{cu} = 1.2 \times 10^5$ N/mm^2.

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