B. Tech 3rd SEM (Mechanical Engineering)
Strength of Material-I (1st Sessional Test)

Time: 1.5 hours **Maximum Marks: 15**

Note: 1) All questions are compulsory.
2) Each question is of five Marks.
3) Assume suitable value for any missing data.

Q1. Sketch the stress-strain diagram for ductile material and explain its salient features. How does the stress-strain curve of brittle materials differ from this curve? 5 (CO2)

Q2. 2. A specimen of steel 20 mm diameter with a gauge length of 200 mm is tested to destruction. It has an extension of 0.25 mm under a load of 80 kN and the load at elastic limit is 102 kN. The maximum load is 130 kN. The total extension at fracture is 56 mm and diameter at neck is 15 mm. Find

(i) The stress at elastic limit.

(ii) Young's modulus.

(iii) Percentage elongation

(iv) Percentage reduction in area

(v) Ultimate tensile stress. 5 (CO1)

Q3. At a point in a material, the stresses on two mutually perpendicular planes are $50N/mm^2$ (tensile) and 30 N/mm^2 (tensile). The shear stress across these planes is $12N/mm^2$. Using Mohr circle, find the magnitude and direction of the resultant stress acting on a plane making an angle of 35^0 with the plane of the first stress. Find also, the normal and tangential stresses on this plane. Compare the results to analytical.

5 (CO1)

B. Tech 3rd SEM (Mechanical Engineering)
Strength of Material-I (2nd Sessional Test)

Time: 1.5 hours Maximum Marks: 15

Note: 1) All questions are compulsory.

Q1 (a) Drive an expression for the torsion equation in a shaft. Deduce the expression for the maximum stresses in solid and hollow shaft.

(b) The outer and the inner diameters of hollow steel shaft are 120mm and 60mm respectively. The shaft transmits 800kW at a speed of 400 rpm while an end thrust

Q2 A beam of length l carries a uniformly distributed load of w/unit length over whole of its span AC. The beam is supported at left end A and a point B such that BC is overhanging portion of the beam. Find the overhang in order that maximum bending moment (+ve or -ve) has minimum value. For this overhang, find reaction and maximum bending moment. Also determine the position of point of contra-flexure.

Q3 A beam 7m long simply supported at ends carries four concentrated loads of 1 kN, 2kN, 3kN and 4kN respectively at 1m, 2m, 3m and 5m from the left end. Find by Macaulay's method of double integration (a) the maximum deflection, (b) deflection at the center of beam and (c) deflection under the 3kN load. Take $EI=12X10^3$ kNm3.