Code No: NR10802 **NR**

I B.Tech Supplementary Examinations, June 2005
STRENGTH OF MATERIALS
(Chemical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the typical stress-strain curve with a neat sketch, obtained from a direct tension test on a mild steel rod and explain the salient points.
   (b) A 500 mm diameter circular reinforced concrete column is having 8 bars of 20 mm diameter. The column is subjected to an axial thrust of 875 kN. Determine the stresses developed in concrete and steel. Assume $E_{steel} = 12\ E_{concrete}$.

2. (a) Define the terms young's modulus, shear modulus, Bulk modulus and Poisson's ratio.
   (b) A bar of certain material 60mm × 60mm in cross-section is subjected to an axial pull of 180 kN. The extension over a length of 100mm is 0.05mm and decrease in each side is 0.00525mm. Calculate modulus of Elasticity, Poisson's ratio, Rigidity Modulus and Bulk modulus.

3. Draw shear force and bending moment diagrams and mark the salient values. {As shown in the Figure1}

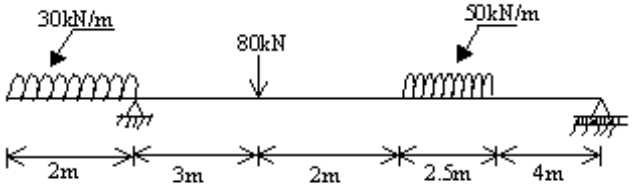

Figure 1:

4. (a) Find the dimensions of the strongest rectangular beam that can be cut out of a log of wood 2.4m diameter.
   (b) A T-beam having flange 150mm × 20mm and web 20mm × 160mm is simply supported over a span of 6.2m. It carries a u.d.l. of 5 kN/m including self weight over its entire span, together with a load of 35 kN at mid span. Find the maximum tensile and compressive stresses occurring in the beam sections and sketch the stresses across the section.

5. A beam of a square section of 300mm side is used with one diagonal horizontal making at a diamond shaped cross section. Find the maximum shear stress in the cross section. Also sketch the shear stress distribution across the depth of

the section. Calculate the average shear stress. The shear force on the section is 120KN.

6. (a) Define a thin cylinder.
   (b) Describe the types of possible failures in a thin cylinder subjected to uniform internal pressure.
   (c) Derive the equation for circumferential stress in the thin cylinder subjected to internal pressure.

7. At a point in a strained material the principal tensile stresses are 100 N/mm^2 tensile and 40 N/mm^2 compressive. Determine the resultant stress in magnitude and direction on a plane inclined at 60^0 to the axis of the major principal stress. What is the maximum intensity of shear stress in the material at the point?

8. A propeller shaft 160 mm external diameter and 80 mm internal diameter transmits 1000 kW of power at 100 r.p.m. In addition, it is subjected to a B.M of 8 kN-m and an end thrust of 120 kNm. Find
   (a) The principal stresses and their planes
   (b) The maximum shear stress and its plane,
   (c) The stress which is acting alone would produce the same maximum strain. Take 1/m = 0.3.

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