Code No: NR10802 **NR**

I B.Tech Supplementary Examinations, November/December 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 difference between ductile and brittle materials. Give examples.
   (b) A steel plate of constant thickness of 12mm is having a breadth of 100mm at one end and uniformly varies to a breadth of 50mm at the other end. It is subjected to an axial compressive force of 50kN at the ends. Take E=200kN/mm^2. The length of the plate is 0.6m. Derive the expression involved and hence find the deformation. [6+10]

2. (a) Derive from first principles the expression for bar of uniform strength.
   (b) For a given material the modulus of elasticity 1.12×10^5 MPa and the modulus of rigidity is 0.48×10^5 MPa. Find the bulk modulus and lateral contraction of a round bar of 45mm diameter and 2.7m length when stretched by 2.5mm. [8+8]

3. For the beam shown in (figure1). sketch the shear force and bending moment diagrams at salient points. [16]

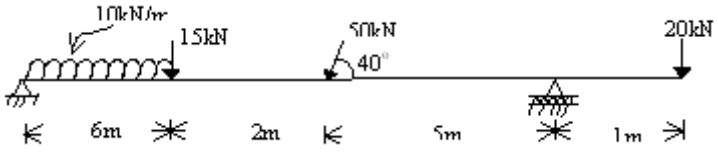

Figure 1:

4. (a) A rectangular beam 200mm wide and 350mm deep is freely supported over a span of 4.8m and carries a load of 3.6 kN/m. It also carries three equal point loads W kN each, equispaced over the beam. If the permissible bending stress is 8MPa, find the maximum allowable value of W.
   (b) State the assumptions involved in the theory of simple bending. [10+6]

5. A cast iron bracket subjected to bending has a cross section of unsymmetrical I-section with a 300mm x 80mm web, 300mm x 100mm top flange and 200mm x 100mm bottom flange. If the cross section is subjected to a shear force of 150KN, draw the shear stress distribution over the depth of the section and also calculate the maximum shear stress. [16]

6. (a) Derive the expression for change in dimensions of thin cylindrical shells.
   (b) Explain and derive the volumetric strain that occur in thin cylinders. [8+8]

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? [16]

8. (a) Derive the Torsion Equation for a Circular shaft and write the assumptions
   (b) A solid cylindrical shaft is to transmit 300 kW power at 100r.p.m.
      i. If the shear is not to exceed 80N/mm^2, find its diameter.
      ii. What percent saving in weight would be obtained if this shaft is replaced by a hollow one whose internal diameter equals to 0.6 of the external diameter, the length, the material and maximum shear stress being the same? [8+8]

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