Strength of Materials-I
(ME-201, Dec. 2003)

Time: 3 Hours Max. Marks: 60

Note: Question No. 1 is compulsory. Attempt any four questions from section B and two questions from section C.

Section-A

1. (a) Explain Upper and lower yield point.
   (b) How is 'thermal stress' different from ordinary stress?
   (c) On which plane in a bar loaded axially, the shear stress would be maximum?
   (d) What are the shapes of bending moment diagrams in case of (i) Uniformly distributed load (ii) A couple altered at any point of a beam.
   (e) What is a flitched beam?
   (f) State the assumptions in deriving torsion equation.
   (g) What is the ratio of the torques transmitted by a hollow and a solid shaft of the same material, length and weight?
   (h) What is a loop stress?
   (i) Differentiate between the behaviour of a short column and a long column when subjected to axial load.
   (j) Briefly define the moment area method.

Section-B

2. Figure shows an application of load 20 KN on a bar made of two sections AB of 10 mm dia and BC of 20 mm dia. Find the magnitude of stress produced in each section. Weight of the bar is negligible.

Fig.

3. A solid steel shaft of 2 m length is to be transmit 50 KW at 150 rpm. If the shear stress in the shaft material is not to exceed 50 MPa and maximum allowable twist in the shaft is P. Calculate the shaft diameter, C=80 GPa.
4. Derive a formula for the hoop stress in a thin spherical shell subjected to internal fluid pressure.
5. Show how the Rankine's formula for struts is derived from Euler's formula and the simple stress strain equation in single dimension.
6. Define Macaulay's method and show how it is applied in case of a loaded beam.

Section-C

7. What is Mohr's circle? Explain the detailed procedure of drawing this circle in case of a general biaxial stress system. Discuss also in detail how a point on the circumference of this circle gives the state on a plane represented by the point.
8. Draw S.F. and B.M. diagram for the simply supported beam loaded as shown in Fig., clearly indicate the magnitude of maximum S.F. and indicating the magnitude of maximum S.F. and B.M.

Fig.

9. Derive the single bending equation:
   $M/I = \sigma/y = E/R$