Code No: C1CE01-C1104 **N5/05**

I B.Tech(ccc) Regular Examinations, December 2007
MECHANICS OF SOLIDS
(Civil Engineering)

Time: 3 hours Max Marks:100

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Derive expressions for normal and tangential stresses in the case of two perpendicular like direct stresses accompanied by a state of simple shear.
   (b) Explain the procedure of obtaining the same using Mohrs circle of stress. [12+8]

2. (a) Represent the max. strain theory graphically
   (b) Using this theory find "f", if the principal stresses at a point in an elastic material are 3f (tensile) 2f (tensile) and f (compressive). The elastic limit = 200 MPa and 1/m = 0.3. [8+12]

3. A solid shaft, 80mm in dia. transmits 120 H.P. running at 180 R.P.M. Calculate the max. intensity of shear stress induced and the angle of twist for a length of 6m. Take $N = 8X10^4 N/mm^2$. [20]

4. A closely coiled helical spring is made out of 10mm dia. steel rod, the coil having 12 complete turns. The mean dia. of spring is 10mm. Calculate the shear stress induced in the section of the rod due to an axial load of 250N. Find also the deflection under the load, energy stored in the spring and the stiffness of spring. Take N = 8 x10^4 N/mm^2. [20]

5. A strut, 6 metres long, end free, has to be erected to withstand a load of 400KN. Two sections are available:
   (a) $300mm \times 150mm$ R.S.J., thickness of flanges 18 mm, thickness of web 10 mm.
   (b) A.C.I. section, 225 mm external diameter, thickness of metal 25 mm. which is more suitable?

   Use Rankine's formula with a factor of safety of 3 in both cases; Fc for steel, $315N/mm^2$ for C.I., $550N/mm^2$. [10+10]

6. Determine the forces in the members EF, DE, and CD of the truss as shown in Figure 1. [20]

7. A steel cylinder of outside diameter 240 mm and inside diameter 200 mm is shrunk on to one having diameters 200 and 160 mm, the interference fit being such that under an internal pressure p, the inner tensile stress in both cylinders = $85.4N/mm^2$. Find the initial difference in the nominal 200 mm diameters and the value of p if $E = 2.1 \times 10^5 N/mm^2$. [20]

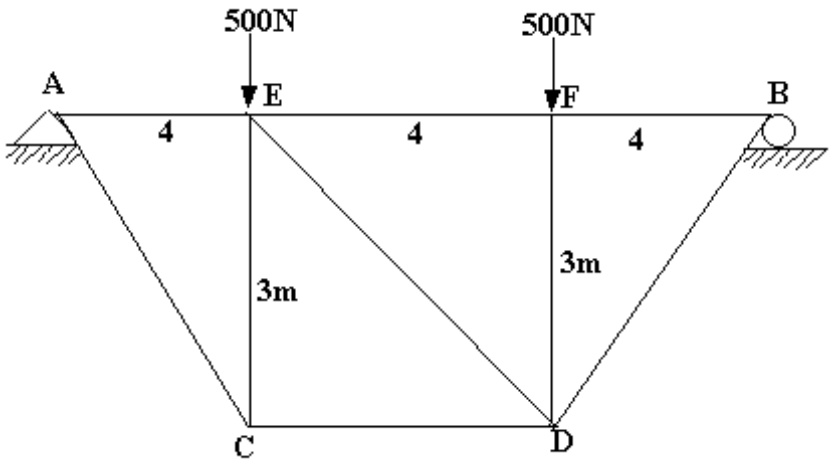

Figure 1:

8. A beam of rectangular section, 60mm wide and 100mm deep in subjected to a B.M. of 12KN-m. The trace of the plane of loading is inclined at 45' to the Y-axis in figure2. Locate the neutral axes of the section. Calculate the max bending stress induced in the section. Verify the result by an alternate solution. [20]

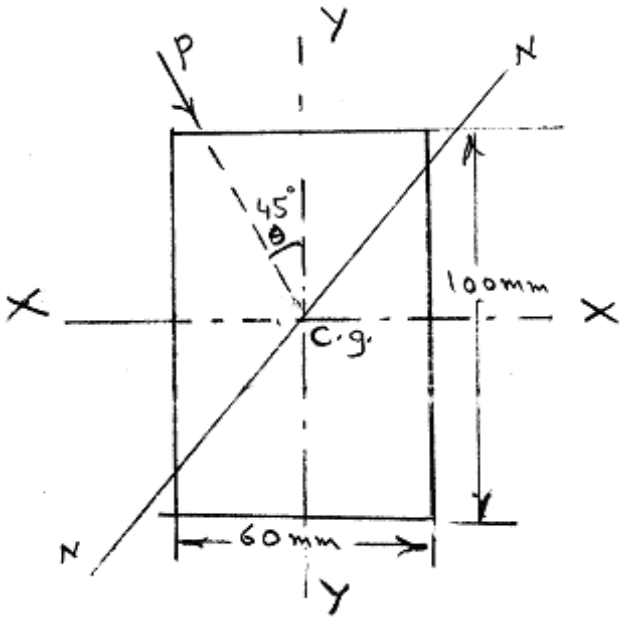

Figure 2:

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