7. A steel disc of uniform thickness and of diameter 900 mm is rotating about its axis at 3000 rpm. Determine the radial and circumferential stresses at the centre and outer radius. The density of material is 7800 kg/m^2 and Poisson's ratio = 0.3.

8. Write short note on : (Any Three)

a) Coulomb yield criterion

b) Hook's law

c) Mohr's circle

d) Stress function

******

Roll No .....

MMMD-102

M.E./M.Tech., I Semester

Examination, December 2015

Theory of Elasticity and Plasticity

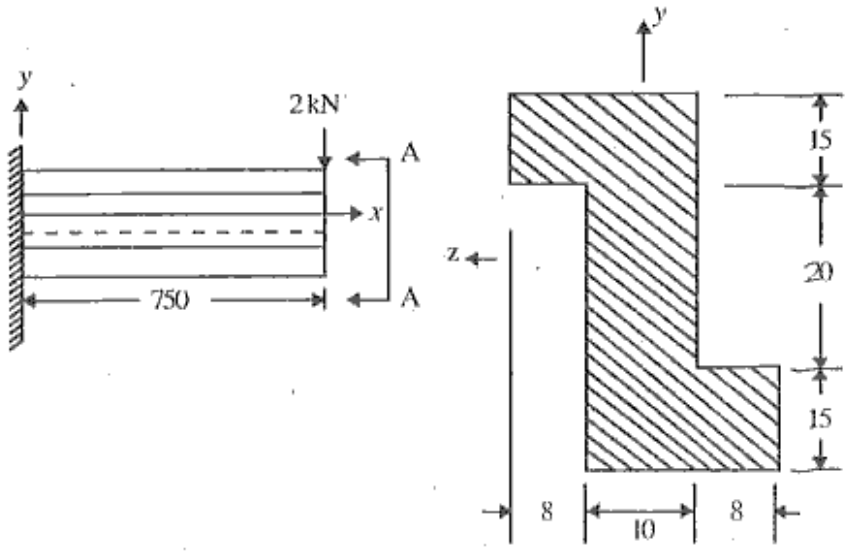
Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.

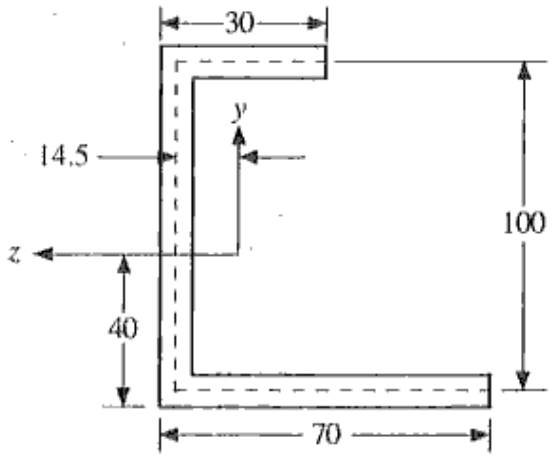
ii) All questions carry equal marks.

1. For the unsymmetrical beam shown in figure neglect Saint-Venant's effect at the right wall and determine the bending stresses at (0, 25, 13) and (0, –25, –13) mm. (All dimensions are in mm)



View A-A enlarged

2. Determine the shear centre for the cross section shown in figure. Dimensions are given from the wall centre where appropriate and the thickness of each wall is $t = 5$ mm.



3. a) Explain in brief the assumptions made in the derivations of stresses in a curved bar.

   b) A hook carries a load of 7.5 kN and the load line is at a distance of 20mm from the inner edge of the section which is trapezoidal. The load line also passes through the centre of curvature of the hook. The dimensions of central horizontal trapezoidal section are : inner width=30mm; outer width=15mm; depth=30 mm. Calculate the maximum and minimum stresses. Also plot the variation of stresses across the section.

4. a) Discuss the stress concentration due to small hole in a strained plate with stress distribution diagram.

   b) Determine the stress field that arise from the stress function.

   $\phi = Cy^2$

   $\phi = Ax^2 + Bxy + Cy^2$

   $\phi = Ax^3 + Bx^2y + Cxy^2 + Dy^3$

   Where A, B, C and D are constants.

5. a) Estimate the torque on a 10 mm diameter steel shaft when yielding begins using (i) The tresca theory and (ii) The Von Mises theory. The yield strength of the steel is 140 MPa.

   b) Derive an expression for Von Mises stress for the ductile material.

6. A cast iron bracket subject to bending has the cross section of I form with unequal flanges. The dimensions of the sections are shown in figure. Find the position of the neutral axis and moment of inertia of the section about the neutral axis. If the maximum bending moment on the section is 40MN mm. Determine the maximum bending stress. What is the nature of the stress?