CE623 Advanced Mechanics of Solids Endsem 21/11/06

- Marks: **Q1=15, Q2=20, Q3=20, Q4=20 Q5=25.**
- Show all working.
- Attempt all parts of a question in a contiguous manner, i.e., dont scatter parts of the same question all over the answerbook.
- **Only one attempt per question will be graded**. So cancel out any attempt you do not want graded. The first not-cancelled attempt will be graded by default.
- **Open book, open notes exam**

1. The uniform cross section rod is subjected to uniform axial stress N at its ends, as shown (Fig. 1). The origin is restrained from rigid body motion. Determine the displacements at point (x,y,z).

2. The infinite wedge is loaded with a uniform load P Nm^{-2}. Obtain the stresses $\sigma_{rr}, \sigma_{r\theta}, \sigma_{\theta\theta}$ as a function of r, θ, P, α. (Fig. 2)

3. The cross-section of a prismatical member is shown in Fig. 3. Using the finite difference method with step size a, find the torsional rigidity (M/α) in terms of the shear modulus G, and a.

4. The link in Fig. 4 has a circular cross section and is made of steel having a yield strength of 250 MPa. Determine the magnitude of P that will initiate yielding. For a circular section (refer Fig. 4a) $A_m = 2\pi(R - \sqrt{R^2 - b^2}$.

5. A thin-walled cantilevered beam having cross-section as shown (Fig. 5) is loaded at its free end as shown. Determine (a) The shear center (b) The total maximum shear stress at section G.

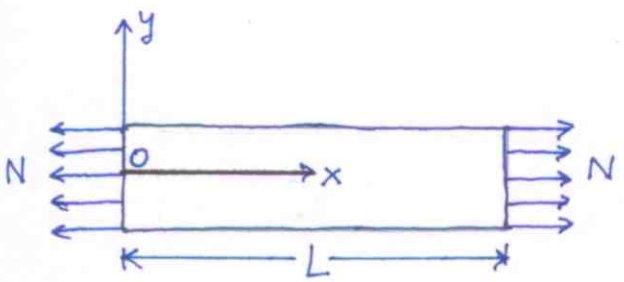

Fig. 1

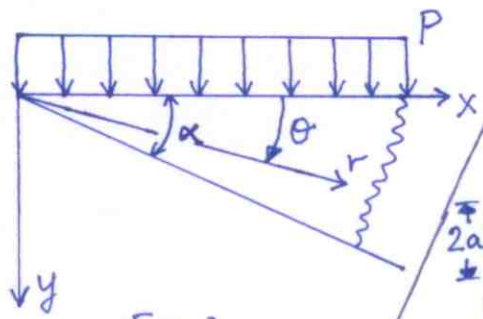

Fig. 2

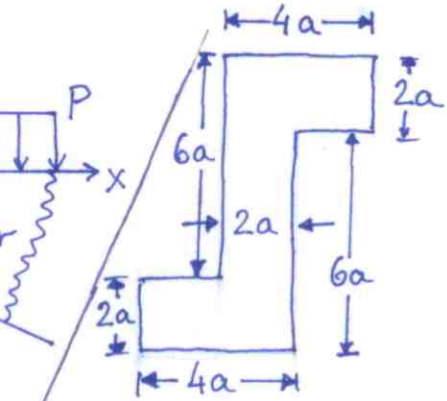

Fig. 3.

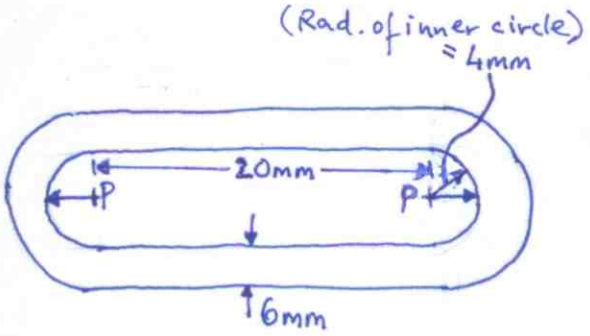

Fig. 4

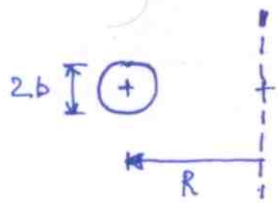

Fig. 4a

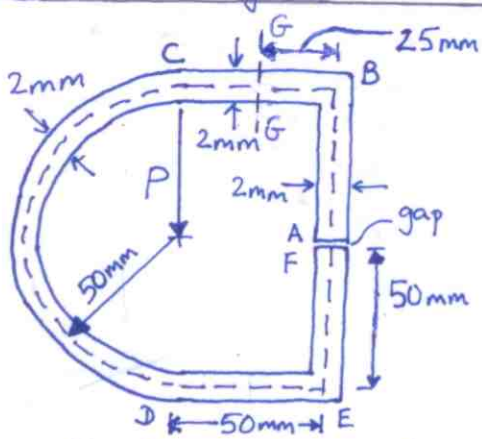

Fig. 5 ℄ distances shown