

Department of Aerospace Engineering, IIT, Madras

AS202 Structures

Quiz 2

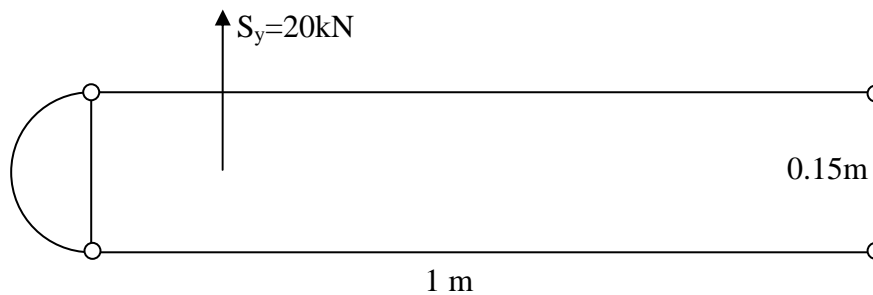
Date: March 25, 2009

Duration: 50 min

Max Marks: 25

Open Book / Open Notes

1. A light airplane wing section is structurally idealized as a semicircle (0.15 m dia) + rectangular box (1.0 m x 0.15 m) as shown in the figure below; the boom areas can be taken as  $2000\text{mm}^2$  each (front) and  $1500\text{mm}^2$  each (rear). The lift load can be taken as 20kN acting 0.3m from the leading edge.
  - a) Determine all the shear flows in the section and show these on a sketch. (12)
  - b) If the skin thickness is 1.5 mm throughout, what is the maximum shear stress? (2)
  - c) What is the twist / unit length of the wing section? ( $G = 25\text{ GPa}$ ) (4)



2. Consider the constant thickness ( $=1.5\text{ mm}$ ) 150mm x 50 mm channel section shown in figure below, with a clockwise twisting moment of 5 kN-m. If the warping can be taken as zero at the mid point of the web (point A) due to symmetry, determine the warping distribution in the section ( $G = 25\text{ GPa}$ ). (7)

