Karunya University
(Karunya Institute of Technology and Sciences)
(Declared as Deemed to be University under Sec.3 of the UGC Act, 1965)

End Semester Examinations - 2015-16 Even Semester - May 2016

14AE3008 Aerospace Structural Analysis

Set A

Time : 3 hrs
Total Marks: 100

1. The cross-section of a beam has the dimensions shown in Fig.1. If the beam is subjected to a negative bending moment of 100 kN m applied in a vertical plane (i.e. M_X = -100 kN), Calculate the maximum direct stress in the stating clearly the point at which it acts.

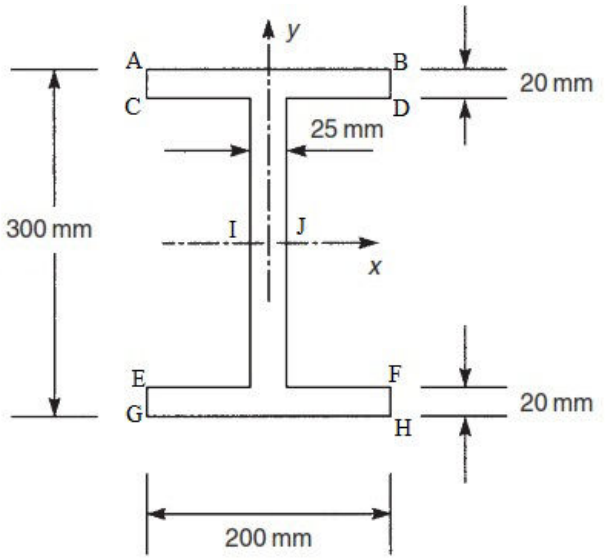


Fig.1

OR

2. Compute the load on the lumped flanges due to bending of the section shown in fig.2.Assume the web do not take part in bending. Compute the loads using moment values with respect to x and y axis and principle axis.

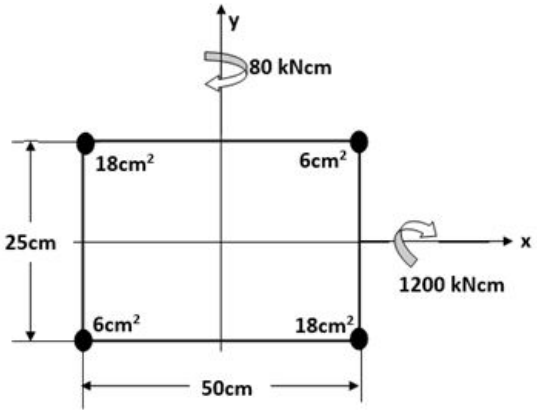


Fig.2

3. Plot the shear flow and shear center location for the section show in figure3.

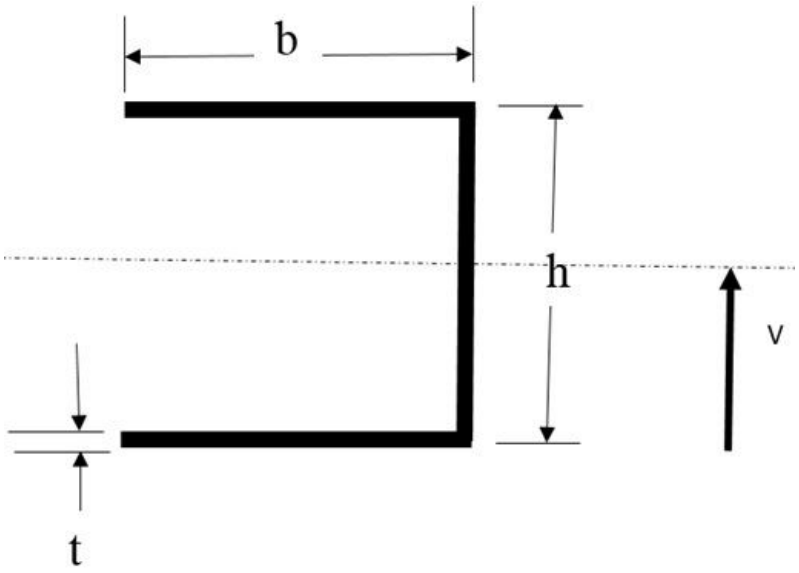


Fig.3

OR

4. The thin-walled single cell beam shown in Fig.4 has been idealized into a combination of direct stress carrying booms and shear stress only carrying walls. If the section supports a vertical shear load of 10 kN acting in a vertical plane through booms 3 and 6, calculate the distribution of shear flow around the section. Boom areas: B_1=B_8=200 mm^2, B_2=B_7=250 mm^2, B_3=B_6=400 mm^2, B_4 = B_5 =100 mm^2.

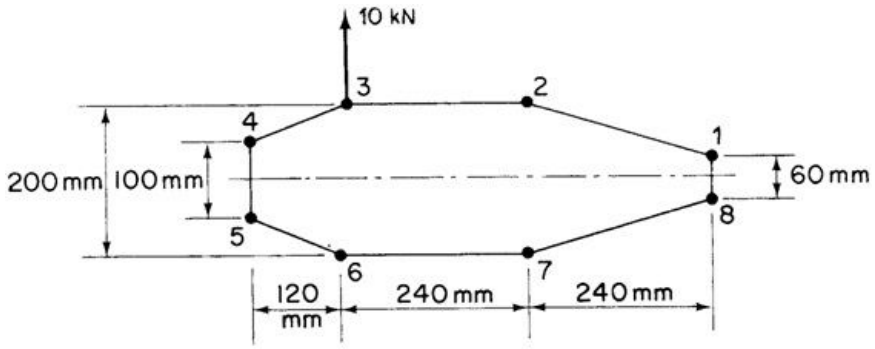


Fig.4

5. Using the method of virtual work, find the vertical deflection component of point E of the truss shown in fig.5. Cross-sectional areas of members are: AE and FD = 250 mm^2 ; EF and EC = 1875 mm^2 ; AB, BC, CD, EB and FC =1250 mm^2; young's modulus E = 200 kN/mm^2 .

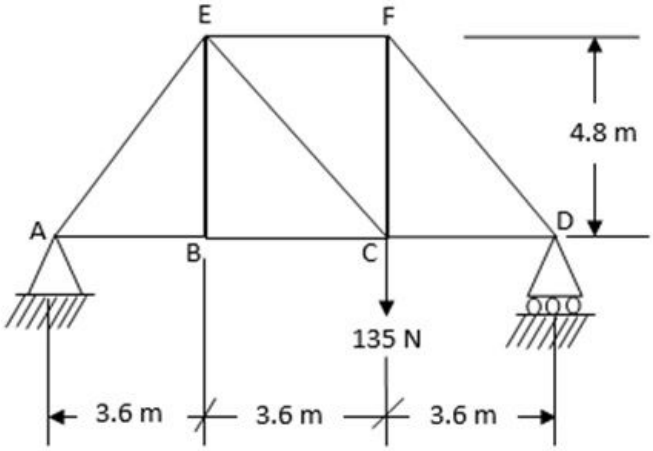


Fig.5

OR

6. Calculate the shear flows in the web panels and direct load in the flanges and stiffeners of the beam shown in fig.6.if the web panels resist shear stresses only.

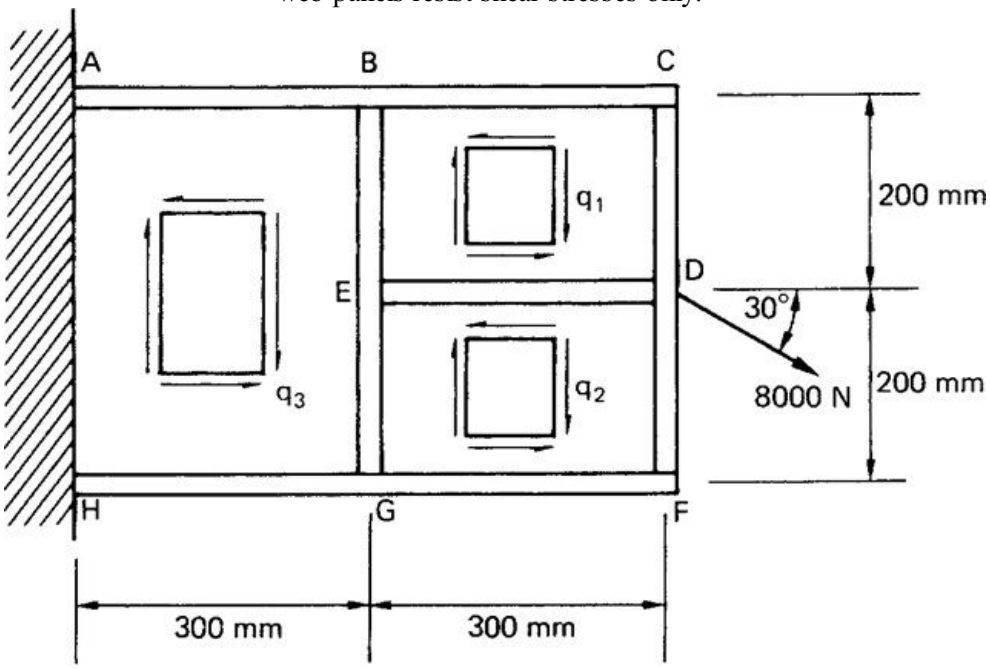
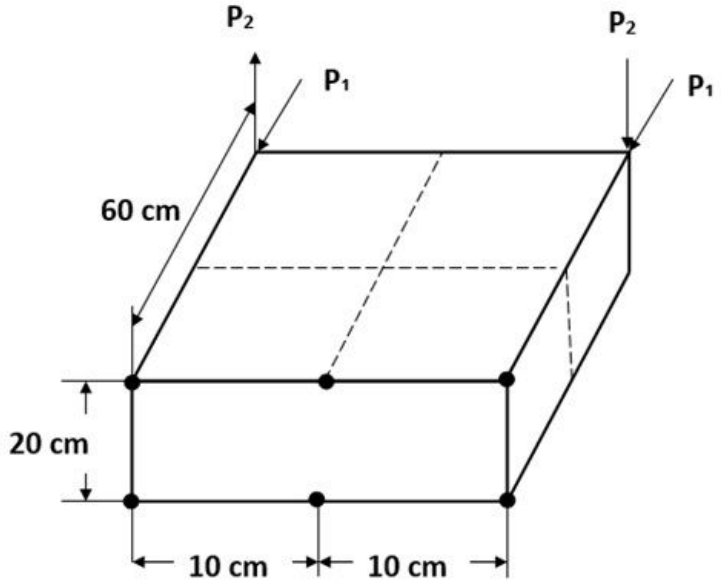


Fig.6

7. Find the margin of safety in buckling for the box beam shown in fig.7. given $P_1 = P_2 = 10$kN. Area of the each stringer $= 2\ cm^2$ and the sheet thickness is 1.5mm throughout. Assume the sheets are effective in bending and made of 2024-T3 Aluminum alloy. For a/b= 3, $k_c = 4$, $k_s = 5.8$.



OR

8. Differentiate between the buckling and crippling and explain how you will calculate Buckling stress in compression. Explain any one method to calculate crippling strength.

9. i. Drive the governing equation for thin plate subjected to pure bending. (12)

   ii. Write the short notes on the structural idealization and analysis of aircraft fuselage. (8)

Wishing you All the Best
