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10AE72

# Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016
## Aircraft Structure – II

Time: 3 hrs. Max. Marks:100

**Note:** ***Answer FIVE full questions, selecting at least TWO questions from each part.***



### PART – A

1 a. Analyze the aircraft structural components for various load carrying capacity with considering wings and fuselage components. **(12 Marks)**

b. Define gust load. Briefly explain and derive for sharp-edge gust load factor. **(08 Marks)**

2 a. A beam having the cross-section as shown in Fig. Q2 (a) is subjected to a bending moment of 1500 Nm in a vertical plane. Calculate the maximum direct stress due to bending stating the point at which it acts. **(12 Marks)**

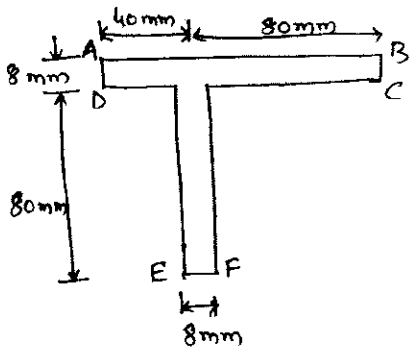


Fig. Q2 (a)

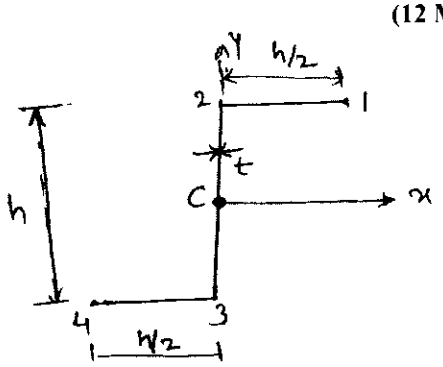


Fig. Q3 (b)

b. Define unsymmetrical bending with example and derive equation for direct stress distribution in case of unsymmetrical bending. **(08 Marks)**

3 a. Show that $q_s = \frac{-S_x}{I_{yy}}\int_0^S t_x ds - \frac{-S_y}{I_{xx}}\int_0^S t_y ds$, for open section beam symmetrical about one of the axis. **(10 Marks)**

b. Determine the direct stress distribution in the thin walled 2 section shown in Fig. Q3 (b) produced by a positive bending moment $M_x$. **(10 Marks)**

4 a. Show that T = 2Aq from Bredt-Batho theory. **(05 Marks)**

b. Determine the shear flow distribution in the beam section shown in Fig. Q4 (b), when it is subjected to shear load in its vertical plane of symmetry. The thickness of the walls of the section is 2 mm throughout. **(15 Marks)**

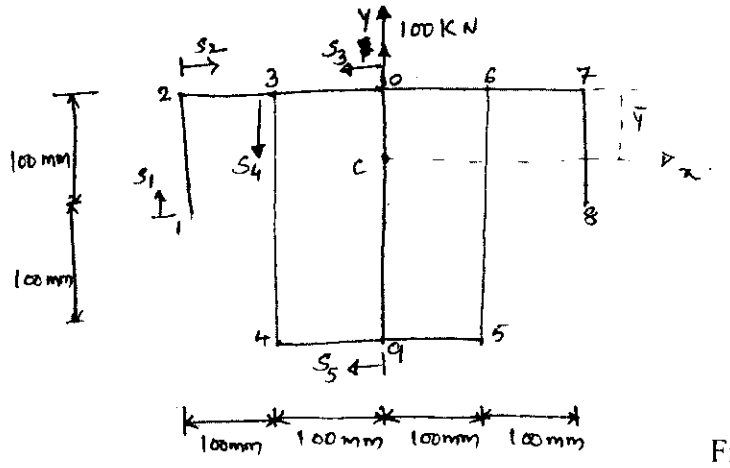


Fig. Q4 (b)

## PART – B

5 a. Derive equation for critical stress for uniform rectangular plate. **(14 Marks)**

b. Define : i) local instability ii) Innterrivet buckling with example. **(06 Marks)**

6 The thin walled single cell beam shown in Fig. Q6 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$^2$
The centroid of the direct stress carrying arelies on horizontal axis of symmetry. **(20 Marks)**

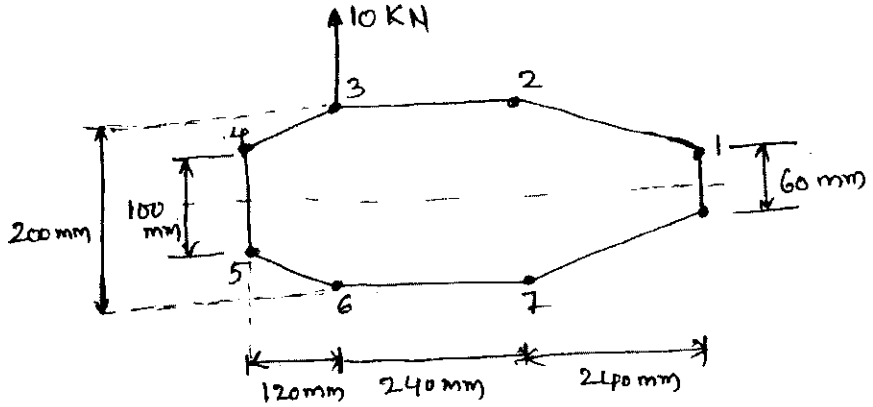


Fig. Q6

7 a. Describe the design criteria applicable to aircraft structures. **(10 Marks)**

b. Discuss the life assessment procedures of aircraft during its design and qualification process. **(10 Marks)**

8 a. Explain the general rules for using bolts in aerospace design. **(06 Marks)**

b. Discuss the salient points to be considered while rivet joints are to be considered. **(06 Marks)**

c. A bracket is supported by means of 4 rivets of same size as shown. Determine the diameter of the rivet, if the maximum shear stress is 140 N/mm$^2$. **(08 Marks)**

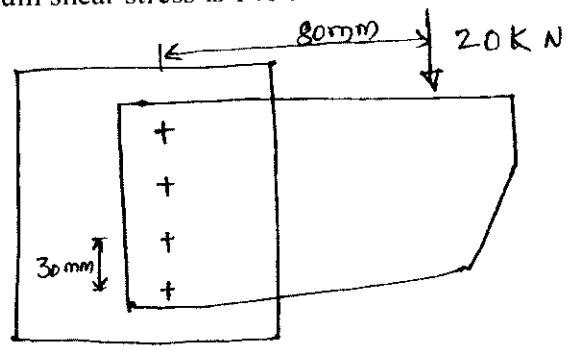


Fig. Q8 (c)

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