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10AE72

Seventh Semester B.E. Degree Examination, May 2017
Aircraft Structures – II

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define gust load and graded gust load. Briefly explain and derive for sharp edged gust load factor. **(08 Marks)**

b. What are the loads acting on various components of the aircraft? **(06 Marks)**

c. Explain the following: i) Factor of safety; ii) Structural design V-N diagram; iii) Crash loads. **(06 Marks)**

2 a. Derive direct stress distribution due to unsymmetrical bending. **(10 Marks)**

b. A beam having cross section as shown in Fig.Q.2(b) is subjected to a bending moment of 1500Nm in a vertical plane. Calculate the maximum stress due to bending stating the point at which it acts. **(10 Marks)**

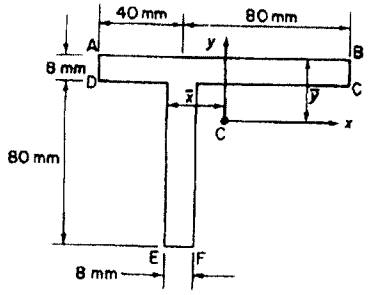


Fig.Q.2(b)

3 a. Derive an expression for the shear stress of an open section which supports shear forces S_x and S_y in the XY axis as shown in Fig.Q.3(a). There is no twist on the beam cross section. **(03 Marks)**

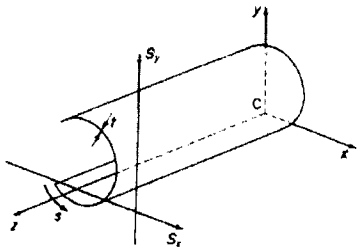


Fig.Q.3(a)

b. Calculate the position of the shear center of a thin walled section shown in Fig.Q.3(b), the thickness of the section is 2mm and is constant throughout. **(10 Marks)**

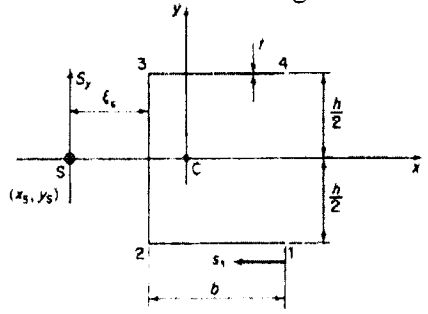
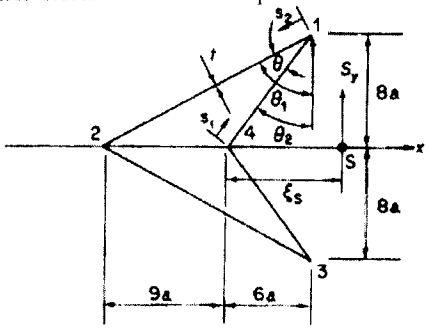


Fig.Q.3(b)

4 a. Show that T = 2Aq from Bredt-Batho formula of shear flow. **(06 Marks)**

b. A thin-walled closed section beam has the singly symmetrical cross-section shown in Fig.Q.4(b). Each wall of the section is flat and has the same thickness t and shear modulus G. Calculate the distance of the shear centre form point 4. **(14 Marks)**

Fig.Q.4(b)



PART – B

5 a. Derive an expression for non-trivial solution for buckling load of a thin flat plate of length b and width a. **(10 Marks)**

b. Define: i) Local instability; ii) Inter rivet and sheet wrinkling. **(10 Marks)**

6 a. The thin-walled single cell beam shown in Fig.Q.6(a) 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 100kN acting in a vertical plane through booms 3 and 6, calculate the distribution of shear flow around the section.

Boom areas: $B_1 = B_8 = 200mm^2$

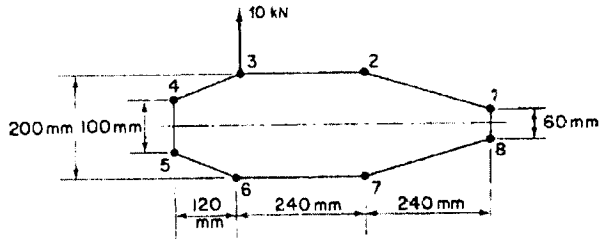
$B_2 = B_7 = 250mm^2$

$B_3 = B_6 = 400mm^2$

$B_4 = B_5 = 100mm^2$

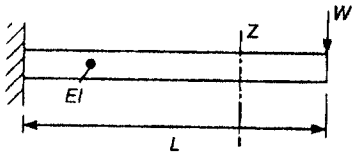
$q_{s,0} = -5.4$ N/mm. **(15 Marks)**

Fig.Q.6(a)



b. Determine the deflection curve and the deflection of the free end of the cantilever shown in Fig.Q.6(b); the flexural rigidity of the cantilever is EI and its section is doubly symmetrical. **(05 Marks)**

Fig.Q.6(b)



7 a. Explain design criteria in relation to aircraft design. **(08 Marks)**

b. Discuss the life assessment procedures of aircraft during its design and qualification process. **(08 Marks)**

c. Explain two-bay crack criteria. **(04 Marks)**

8 a. Explain the general rules for using bots in aerospace design. **(04 Marks)**

b. What are the modes of failure of a riveted joint? **(12 Marks)**

c. Explain the concept of effective width. **(04 Marks)**

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