CBCS SCHEME

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18AE62

Sixth Semester B.E. Degree Examination, June/July 2023
Aircraft Structures – II

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Derive an equation for Bending stress and write an equation for Max stress. **(10 Marks)**

b. Explain the following :

(i) Structure (ii) Bending
(iii) Symmetrical bending (iv) Unsymmetrical bending
(v) Theory of simple bending **(10 Marks)**

OR

2 a. Show the equation for direct stress distribution in case of unsymmetrical bending. **(10 Marks)**

b. A beam having the cross section as shown is subjected to a bending moment of 1500 Nm in a vertical plane. Calculate the max direct stress due to bending stating the point at which it acts.

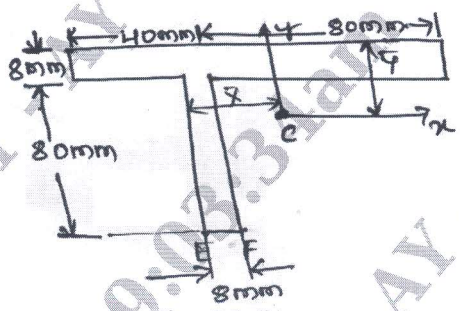

Fig. Q2 (b) **(10 Marks)**

Module-2

3 a. Discuss the concept of shear flow for a closed section and obtain an equation for Breadth-Batho Theory. **(10 Marks)**

b. Derive an expression for twist rate method of constant shear flow (or) Torsion of thin walled closed section. **(10 Marks)**

OR

4 a. Calculate the shear flow distribution of channel section which is subjected to vertical shear load 1000 N.

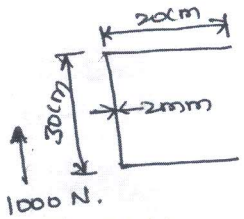

Fig. Q4 (a) **(10 Marks)**

b. Show the expression for the shear stress of an open section which supports shear forces S_X and S_Y in the XY axis as shown. **(10 Marks)**

Module-3

5 a. Explain the Buckling of isotropic flat plate in compression. **(10 Marks)**

b. Determine the crippling strength of the formed section shown in Fig. Q5 (b). F_{cy} = 288 MPa, E = 75 GPa, A = 1.75 cm^2.

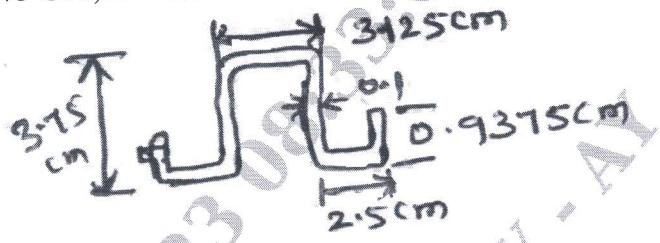

Fig. Q5 (b) **(10 Marks)**

OR

6 a. Explain briefly about Needam and Gerard method for determining the crippling stress. **(10 Marks)**

b. Explain briefly about different types of Riveted joints using in aircraft industry. **(10 Marks)**

Module-4

7 a. A wing section is in the form of 2 cell box as shown in Fig. Q7 (a), in which vertical spars are connected to the wing skin through angle section, all having cross sectional area of 300 mm^2. Idealize the section.

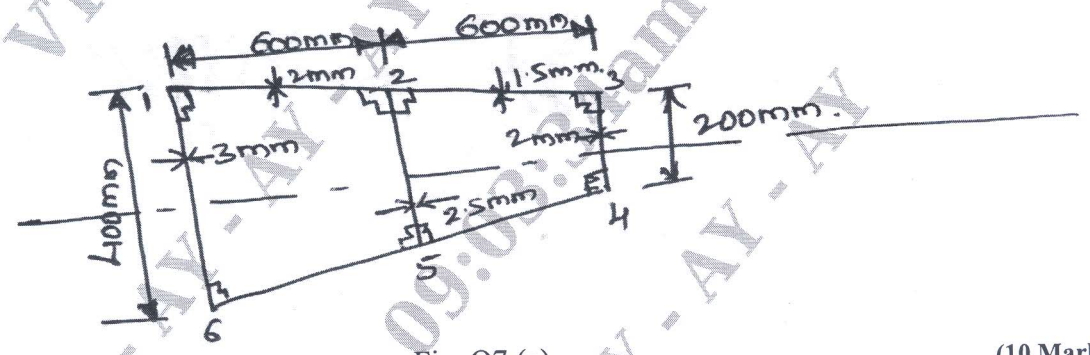

Fig. Q7 (a) **(10 Marks)**

b. Explain briefly about Design Criteria and Safety Factor. **(10 Marks)**

OR

8 a. The wing section is shown in Fig. Q8 (a) has been idealized such that Boom's carry all the direct stress, if the wing section is subjected to a bending moment of 300 kNm in a vertical plane. Calculate the direct stress in the Booms.
$B_1 = B_6 = 2580\ mm^2$, $B_2 = B_5 = 3800\ mm^2$, $B_3 = B_4 = 3230\ mm^2$

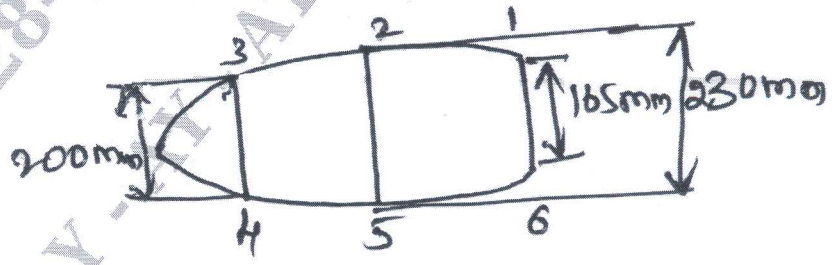

Fig. Q8 (a) **(10 Marks)**

b. Explain the concept of structural idealization and write the Basic Assumptions. **(10 Marks)**

Module-5

9 a. The Cantilever beam is shown in Fig. Q9 (a) is uniformly tapered along its length in both x and y directions and carries a load of 100 kN at its free end. Calculate the forces in the boom and the shear flow distribution in the walls at the section 2 m from the built in end. If the boom resist all the direct stresses while the walls are effective in shear. Each corner boom has a cross sectional area of 900 mm^2 while both central booms have cross sectional area of 1200 mm^2.

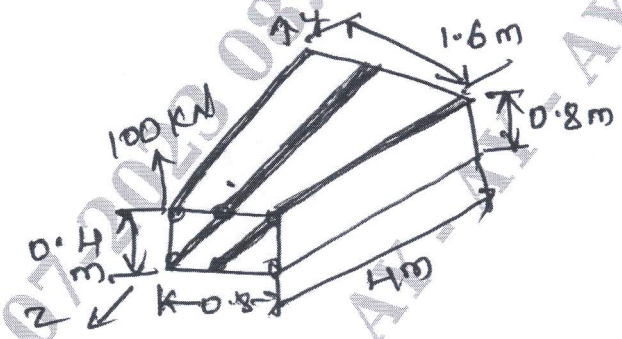

Fig. Q9 (a)

(20 Marks)

OR

10 a. Derive an expression for Tapered wing spar. **(10 Marks)**

b. The fuselage of a light passenger carrying aircraft has the circular cross section shown in Fig. Q10 (b). The cross sectional area of each stringer is 100 mm^2 and the vertical distances given in Fig. Q10 (b) are to the mid-line of the section wall at the corresponding stringer position. If the fuselage is subjected to a bending moment of 200 kNm applied in the vertical plane of symmetry, at this section, calculate the direct stress distribution.

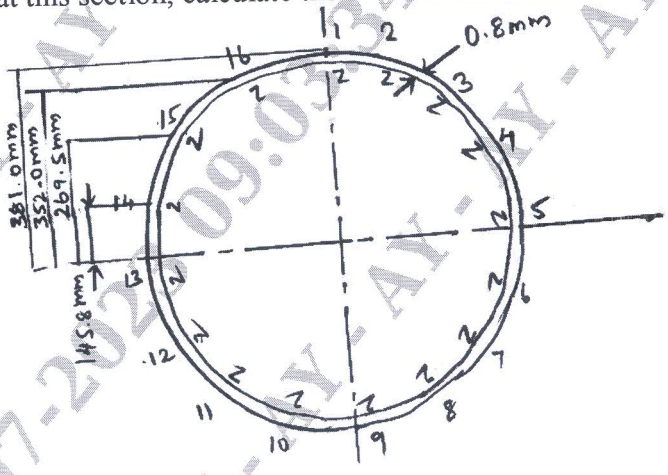

Fig. Q10 (b)

(10 Marks)

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