CBCS SCHEME

USN

18AE62

Sixth Semester B.E. Degree Examination, Dec.2024/Jan.2025

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 expression for Bending stress under Pure Bending. And the assumptions made for symmetric bending. **(10 Marks)**

b. The dimension of the stringer of an Aircraft wing is as shown in the Fig. Q1 (b) below. Find out the point where bending stress is maximum. Take $M_x = 10$ kNm, $M_y = 20$ kNm. **(10 Marks)**

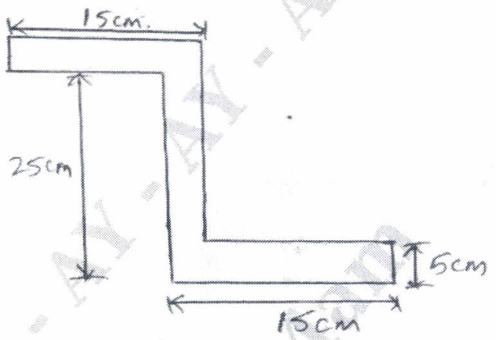

Fig. Q1 (b)

OR

2 a. Derive an expression for direct stress and inclination of neutral axis for an un-symmetrical section subjected to bending moments in X and Y axis. **(10 Marks)**

b. Determine the deflection curve and the mid span deflection of the simply supported beam when point load is applied. **(10 Marks)**

Module-2

3 a. Derive the equation for shear flow of an open section and show that for a section which is symmetric about are axis expression for shear flow is as follows :

$$q_s = \frac{-S_x}{I_{yy}}\int_0^s t_x ds - \frac{-S_y}{I_{xx}}\int_0^s t_y ds$$ **(10 Marks)**

b. A thin walled C-section is subjected to 1500 N shear force in Y-direction. Find the shear flow distribution and Identify the shear center. **(10 Marks)**

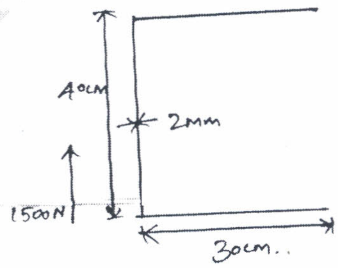

Fig. Q3 (b)

OR

4 a. Determine the shear flow of the section when subjected to a shear force along vertical direction. **(10 Marks)**

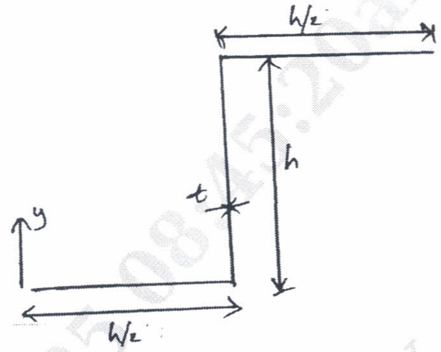

Fig. Q4 (a)

b. Find the shear flow distribution for the Fig. Q4 (b) shown below. **(10 Marks)**

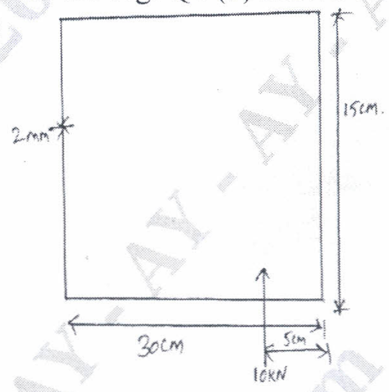

Fig. Q4 (b)

Module-3

5 a. Explain Wagneis beam with neat diagram and derive the relation for tensile stress in a pure tension field beam. **(10 Marks)**

b. Derive the equation for an Isotropic flat plate under compression with necessary graph and figures. **(10 Marks)**

OR

6 a. Explain the different modes of failure in Rivets with diagrams and necessary equations. **(10 Marks)**

b. Find the Resultant force on each rivet of the connection shown in Fig.Q6 (b).

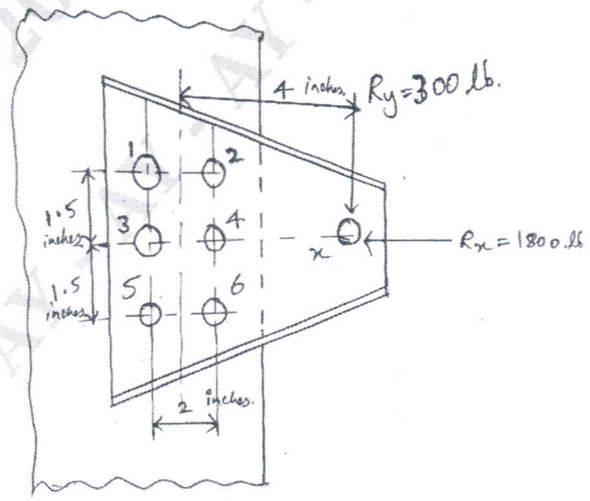

Fig. Q6 (b) **(10 Marks)**

Module-4

7 a. Explain about two bay crack criteria and widespread fatigue damage. **(10 Marks)**

b. Find the shear flow distribution for the section given below using structural idealization method. **(10 Marks)**

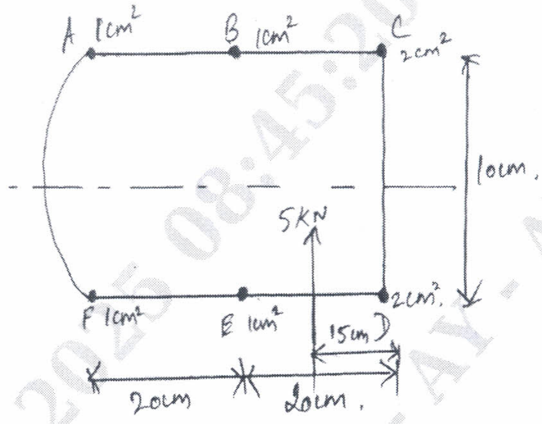

Fig. Q7 (b)

OR

8 a. Find the shear flow distribution of the closed section given below. Assume that the beam areas will carry bending stress and the skin will carry shear stress. **(10 Marks)**

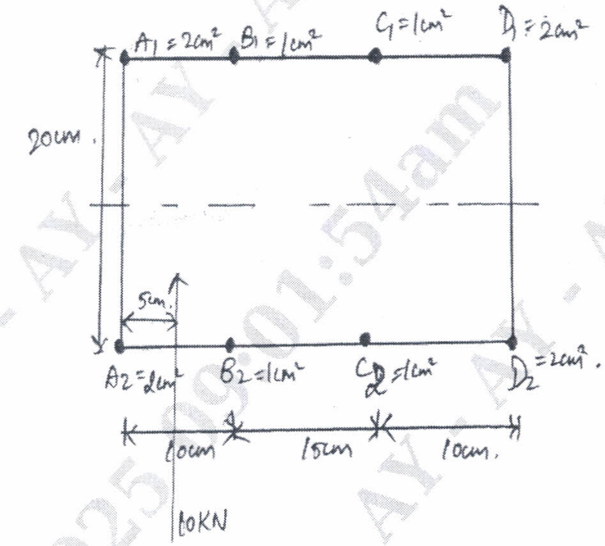

Fig. Q8 (a)

b. Find out the bending stress for a given section when subjected to a shear load of 1000 N acting in vertical direction. **(10 Marks)**

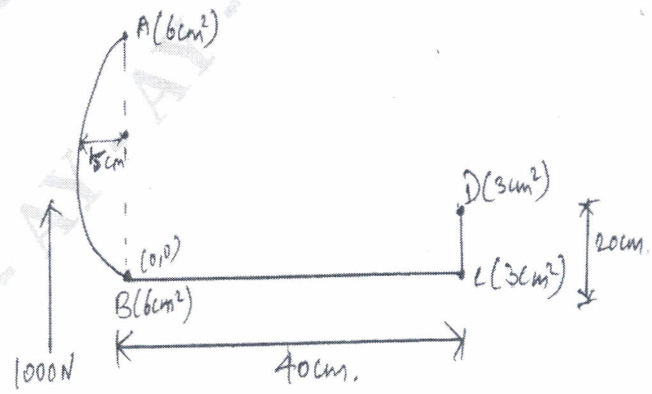

Fig. Q8 (b)

Module-5

9 a. Derive the derivation for Tapered wing spar. **(10 Marks)**

b. If torque of a section is 3×10^3 Nm, obtain the shear flow and rotation θ for the section and obtain the maximum shear stress of each and every element. Take $G = 26.3\times10^3$ Pa, $t_1 = 0.005$ m, $t_2 = t_3 = 0.007$ m **(10 Marks)**

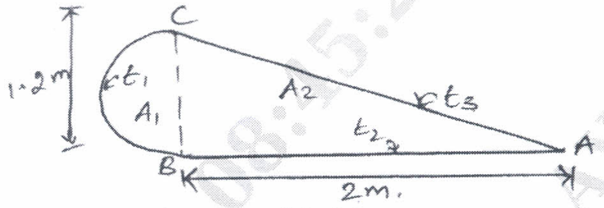

Fig. Q9 (b)

OR

10 a. Consider a circular fuselage section subjected to a bending moment $M_x = 800$ kNm. The fuselage is idealized as normal stress carrying booms and shear stress carrying panels. The section is symmetric about x and y axis. The area of the boom is given below. Calculate direct stress acting on each and every boom, where $B_1 = B_4 = B_5 = B_8 = 1800\text{mm}^2$; and $B_2 = B_3 = B_6 = B_7 = 1400\text{mm}^2$ **(10 Marks)**

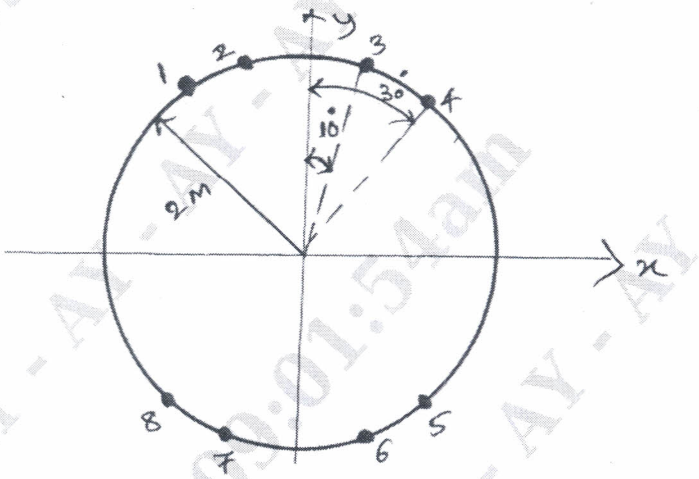

Fig. Q10 (a)

b. Derive the derivation for shear flow in multicell section and the procedure to find the shear flow distribution in a wing box structure. **(10 Marks)**

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