CBCS SCHEME

USN

18AE62

Sixth Semester B.E. Degree Examination, Jan./Feb. 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. The cross section of a beam has the dimensions as shown in Fig.Q1(a). If the bema section is subjected to a bending moment of 100kNm applied in a plane parallel to the longitudinal axis of the beam but inclined at 30° to the length of vertical. The sense of the bending moment is clockwise when viewed from the left –hand edge of the beam section. Determine the distribution of direct stress.

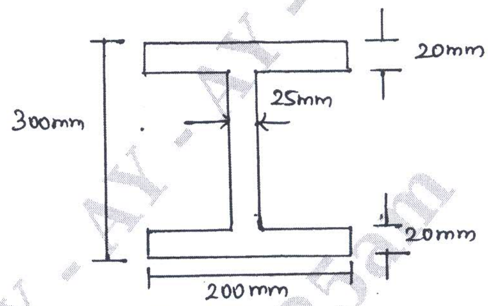

Fig.Q1(a) **(10 Marks)**

b. What are the assumptions made for symmetrical bending? Derive an equation to determine the direct stress distribution due to symmetrical bending. **(10 Marks)**

OR

2 a. Derive an equation to determine the deflection due to bending. **(10 Marks)**

b. Determine the direct stress distribution in the thin-walled Z-section shown in Fig.Q2(b) produced by a positive bending moment M_x.

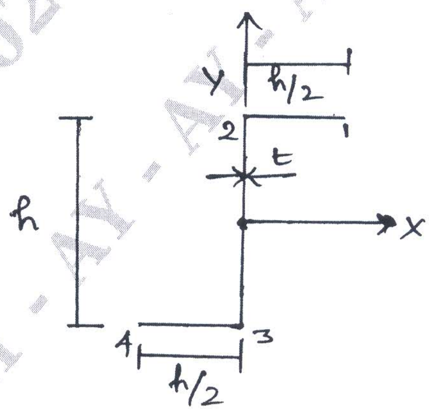

Fig.Q2(b) **(10 Marks)**

Module-2

3 a. Drive an equation to determine the shear flow distribution for a closed-section beams. **(10 Marks)**

b. Explain Bredt–Batho theory and determine the displacement associated with Bredt–Batho shear flow. **(10 Marks)**

OR

4 a. Determine the shear flow distribution in the thin-walled z section as shown in Fig.Q4(a), due to a shear load S_y applied through the shear center of the section.

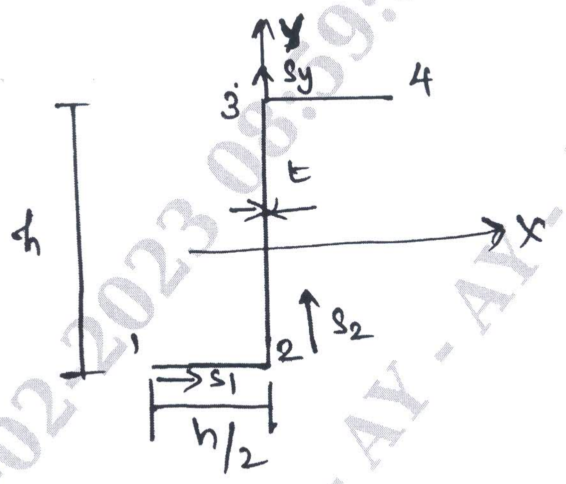

Fig.Q4(a) **(10 Marks)**

b. Determine the direct stress distribution in the wing section shown in Fig.Q4(b). When it is subjected to a bending moment of 5000Nm applied in a vertical plane.

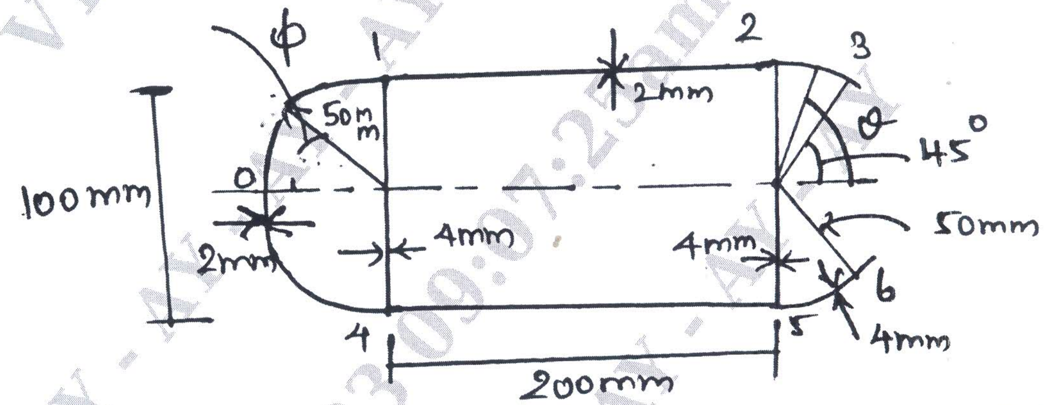

Fig.Q4(b) **(10 Marks)**

Module-3

5 a. Explain the Needham and Gerald method for determining crippling stress. **(10 Marks)**
b. Discuss briefly the local crippling failure subjected in columns. **(10 Marks)**

OR

6 a. With neat sketch, briefly explain the accuracy of fitting analysis. **(10 Marks)**
b. Explain the buckling of Isotropic flat plates in compressor. **(10 Marks)**

Module-4

7 a. Write short notes on :
i) Design criteria
ii)Design life criteria. **(10 Marks)**
b. Briefly explain :
i) Widespread fatigue damage
ii) Two – bay crack criteria. **(10 Marks)**

OR

8 a. Explain the principle of structural idealization and explain the idelisation of a panel. **(10 Marks)**

b. Calculate the shear flow distribution is the channel section shown in Fig.Q8(b) produced by a vertical shear load of 4.8kN acting through its shear center. Assume that the walls of the section are effective in resisting only shear stresses, while the booms each of area 300mm^2, carry all the direct stresses.

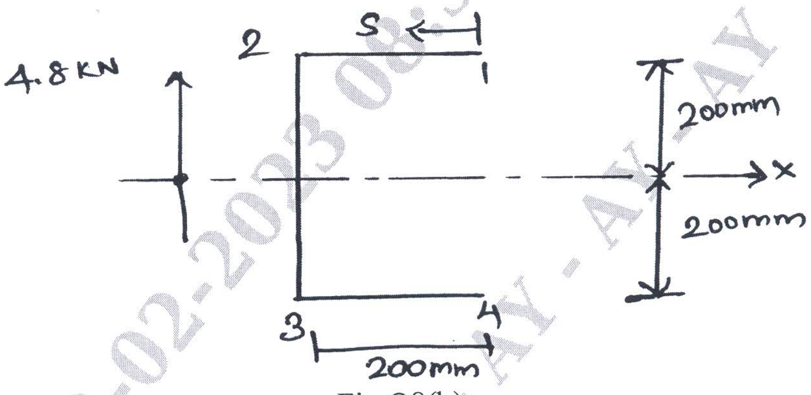

Fig.Q8(b) **(10 Marks)**

Module-5

9 a. Determine the shear flow distribution in the web of the tapered beam shown in Fig.Q9(a), at a section midway along its length. The web of the beam has a thickness of 2mm and is fuly effective in resisting direct stress. The beam tapers symmetrically about its horizontal centroidal axis and the cross-sectional area of each flange is 400mm^2.

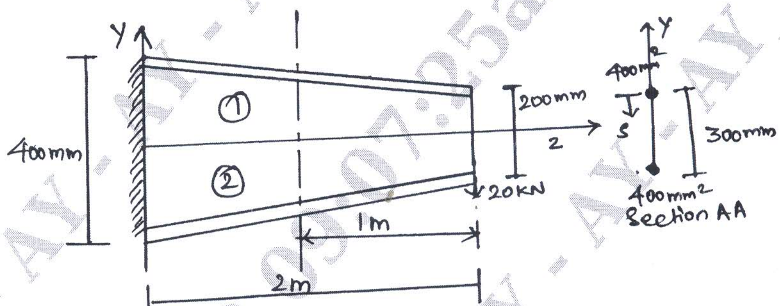

Fig.Q9(a) **(10 Marks)**

b. The wing section shown in Fig.Q9(b) has been idealized such that booms. Carry all the direct stresses. If the wing section is subjected to a bending moment of 300kNm applied in a vertical plane. Calculate the direct stresses in the booms.
Boom areas : $B_1 = B_6 = 2580$ mm^2, $B_2 = B_5 = 3880$mm^2, $B_3 = B_4 = 3230$ mm^2.

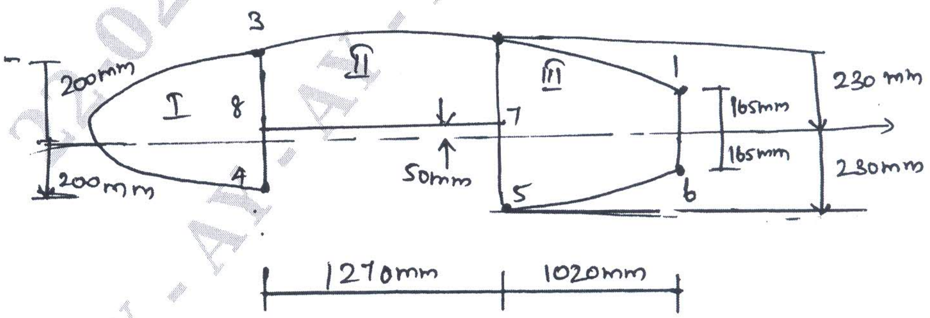

Fig.Q9(b) **(10 Marks)**

OR

10 a. Explain cut outs in fuselages. Briefly with relevant sketches. **(10 Marks)**

b. Explain the principles of stiffeners construction in fuselages. **(10 Marks)**