CBCS SCHEME

USN | | | | | | | | | | 15AE64

Sixth Semester B.E. Degree Examination, Jan./Feb. 2023
Aircraft Structures – II

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Derive an equation for direct stress distribution due to unsymmetrical bending and determine the position of neutral axis. **(08 Marks)**

b. A beam having cross section as shown in Fig Q1(b) is subjected to a bending moment of 1500Nm in a vertical plane. Calculate the maximum direct stress due to bending, stating the point at which it acts.

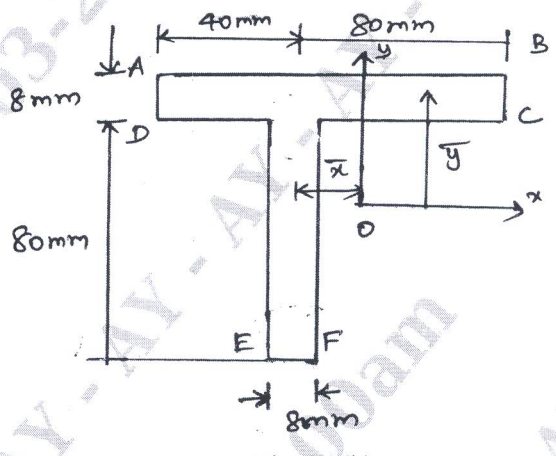

Fig Q1(b) **(08 Marks)**

OR

2 a. Define shear center. Derive an equation for shear flow distribution in open section beam. **(08 Marks)**

b. Explain Bredt-Batho Theory and determine the displacement associated with Bredt – Batho shear flow. **(08 Marks)**

Module-2

3 The thin walled single cell boom shown in Fig Q3 has been idealized in to a combination of direct stress. Carrying booms and shear stress only carrying walls. If the section supports a vertical shear load of 10kN acting in a vertical plane through booms 3 and 6. Calculate the distribution of shear flow around the section.

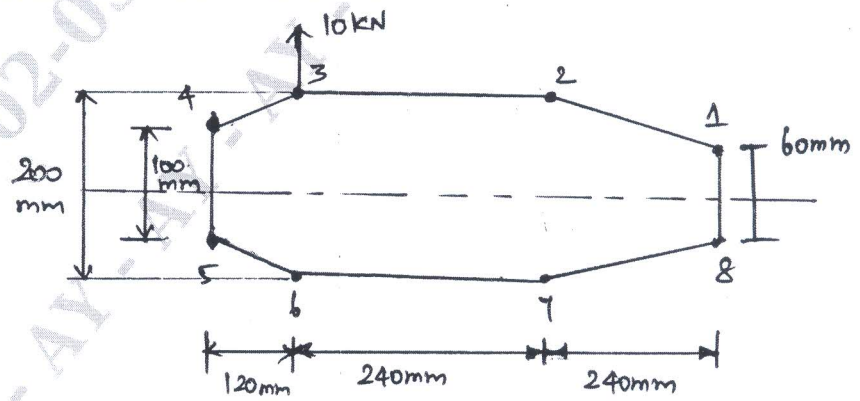

Fig Q3 **(16 Marks)**

OR

4 a. Explain the principle of structural idealization and explain the idealization of a panel. **(08 Marks)**

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

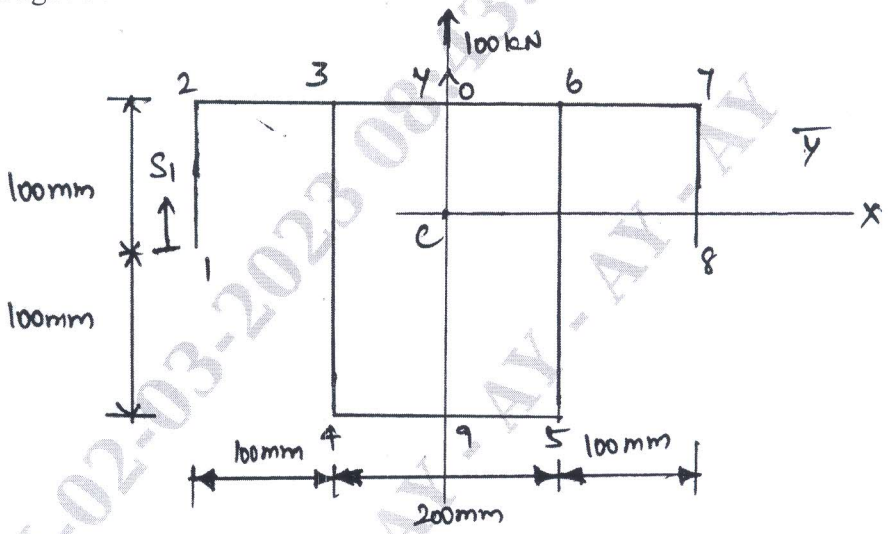

Fig Q4(b) **(08 Marks)**

Module-3

5 a. Discuss about the local crippling future subjected in columns. **(08 Marks)**

b. Explain the buckling of Isotropic flat plates in compression. **(08 Marks)**

OR

6 a. Explain the eccentrically loaded connections in bolts and Riverts. **(08 Marks)**

b. Explain Needham and Gerard method for determining crippling stresses. **(08 Marks)**

Module-4

7 a. A wing spar has the dimensions as shown in Fig Q7(a) and carries a uniformly distributed load of 15kN/m along its complete length. Each flange has a cross section area of $500mm^2$ with the top flange being horizontal. If the flanges are assumed to resist all direct loads while the spar web is effective only in shear, determine the flange loads and the shear flows in the web at section 1 and 2 from free end.

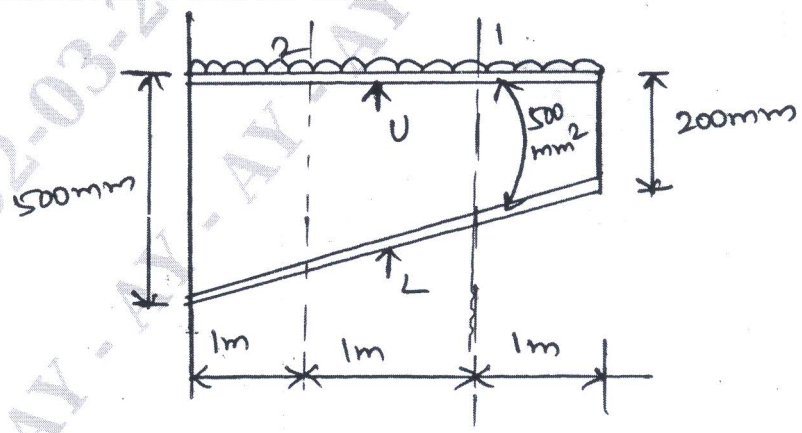

Fig Q7(a) **(08 Marks)**

b. Determine the shear flow distribution in the web of the tapered beam as shown in Fig Q7(b), at a section midway along its length. The web of the beam has a thickness of 2mm end is fully effective in resisting direct stress. The beam taper symmetrically about its horizontal centroid axis and the cross sectional area of each flange is 400mm^2.

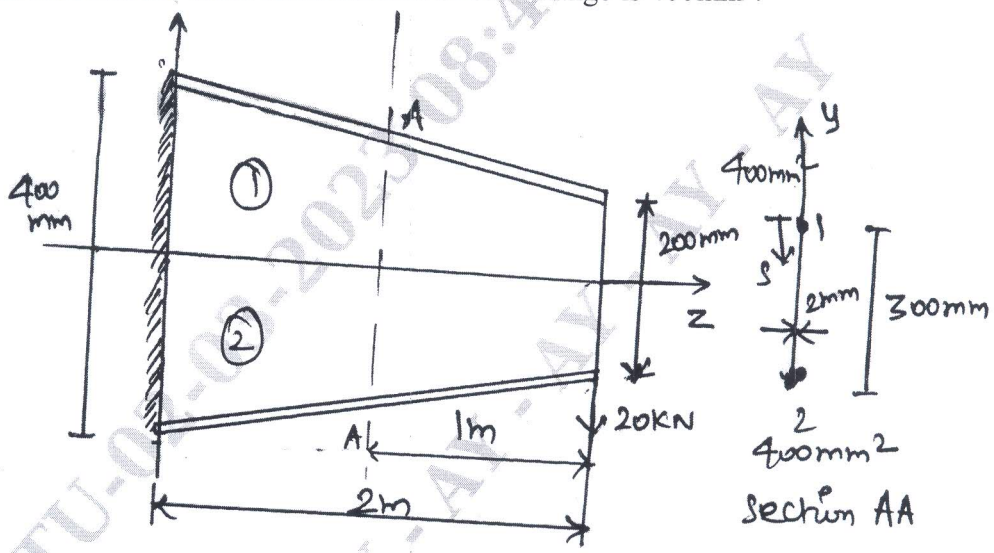

Fig Q7(b) **(08 Marks)**

OR

8 The wing section shown in Fig Q8 has been idealized such that the 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 area $B_1 = B_6 = 2580mm^2$, $B_2 = B_5 = 3880mm^2$, $B_3 = B_4 = 3230mm^2$

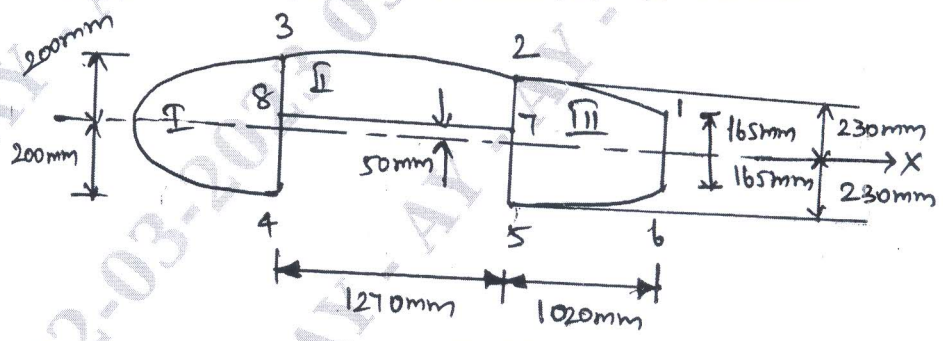

Fig Q8 **(16 Marks)**

Module-5

9 a. Explain the principles of stiffener construction. **(08 Marks)**
b. Write a short note on fuselage frames. **(08 Marks)**

OR

10 a. Discuss the cut-outs in fuselage in brief. **(08 Marks)**

b. The fuselage of a light passenger carrying air craft has the circular cross section shown in Fig Q10(b). The cross sectional area of each stringer is 100mm^2 and the vertical distances in the Fig 10(b) are to mid line of the section wall at the corresponding stringer position. If the fuselage is subjected to a bending moment of 200kNm applied in the vertical plane of symmetry at this section, calculate the direct stress distribution and distance between idealized section booms are 149.6mm.

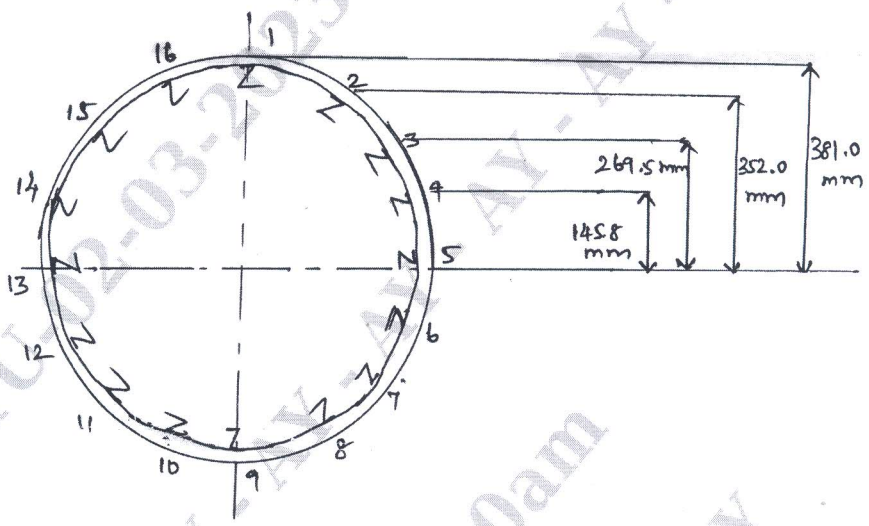

Fig Q10(b) **(08 Marks)**

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