CBCS SCHEME

USN | | | | | | | | | | **18AS54**

Fifth Semester B.E. Degree Examination, July/August 2021
Aerospace Structures – II

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions.***

1 a. Calculate the moment of inertia about the axis of symmetry and also maximum bending stress for the following section which subjected to a bending moment of 40MN-mm. (Refer Fig.Q1(a)). **(10 Marks)**

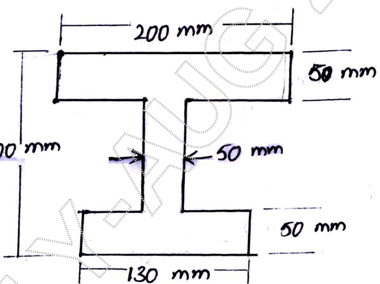

Fig.Q.1(a)

b. Determine the bending stress for the following Cantilever beam with length of 4m. (Refer Fig.Q1(b)) **(10 Marks)**

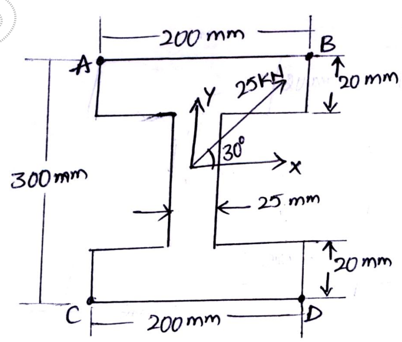

Fig.Q.1(b)

2 a. Define and derive formulae for direct stress distribution for unsymmetrical bending. **(08 Marks)**

b. Calculate the maximum direct stress due to bending moment of 1500Nm acting in a vertical plane as shown in Fig.Q.2(b) **(12 Marks)**

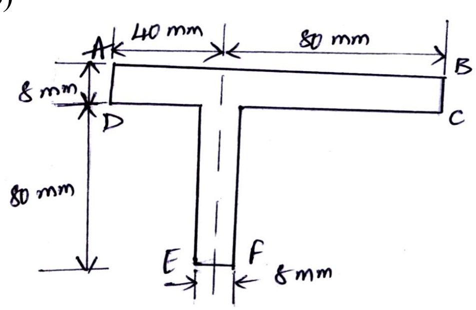

Fig.Q.2(b)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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3 a. Determine the shear flow distribution for the following 'C' section. (Refer Fig.Q.3(a)). **(08 Marks)**

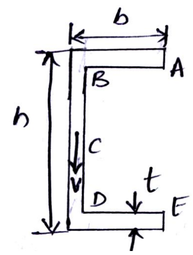

Fig.Q.3(a)

b. Calculate the shear flow and shear centre for the following section. (Refer Fig.Q.3(b)). **(12 Marks)**

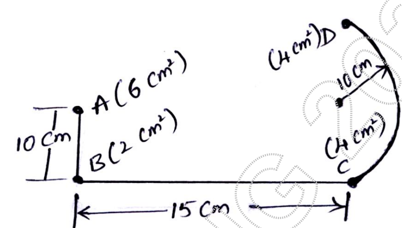

Fig.Q.3(b)

4 a. Determine shear centre for the channel section which subjected to a vertical load of 48000N acting through shear centre. Assume that walls are ineffective and each boom area is 300mm^2. (Refer Fig.Q.4(a)). **(06 Marks)**

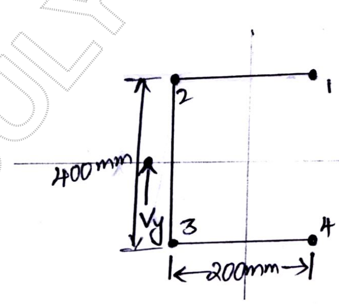

Fig.Q.4(a)

b. Find the shear flow distribution for the Z-section as shown in Fig.Q.4(b), which is having constant thickness of 2mm. **(14 Marks)**

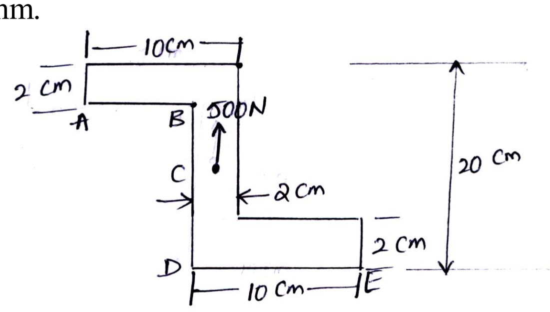

Fig.Q.4(b)

5 a. A single cell rectangular beam carrying the load of 100N. Find the shear flow pattern for section ABCD. (Refer Fig.Q.5(a)). **(12 Marks)**

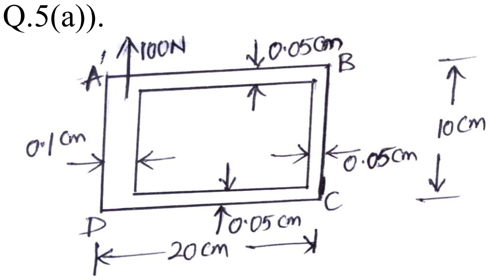

Fig.Q.5(a)

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b. Determine the shear flow and angle of twist per unit length for the following section, which is having constant thickness of 0.1cm, $G = 25 \times 10^5$ N/cm^2. (Refer Fig.Q.5(b)) **(08 Marks)**

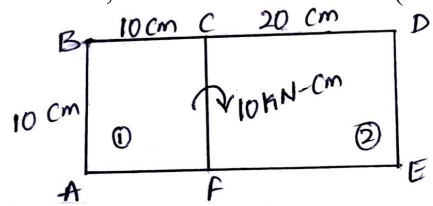

Fig.Q.5(b)

6 a. Determine the shear flow and shear centre for the section given below. (Refer Fig.Q.6(a)). **(10 Marks)**

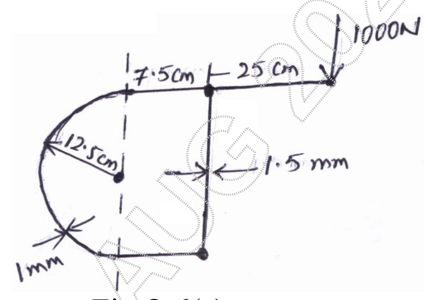

Fig.Q.6(a)

b. Calculate the shear flow in the cell structure and obtain the angle of twist per unit length for the structure given below: (Refer Fig.Q.6(b)). **(10 Marks)**

T = 100000N-mm
$A_1 = 70000\text{mm}^2$
$A_2 = 250000\text{mm}^2$

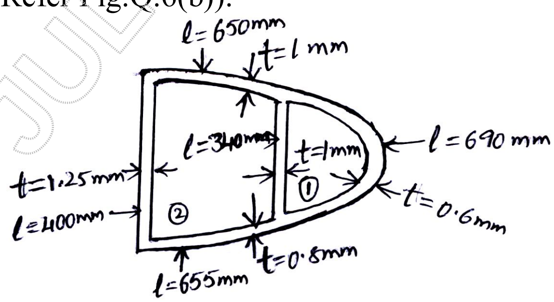

Fig.Q.6(b)

7 Explain Tension field web beams. **(20 Marks)**

8 a. The beam shown in Fig.Q.8(a) is assumed to have a complete tension field web. If the cross-sectional areas of the flanges and stiffeners are 350mm^2 and 300mm^2 respectively and the elastic section modulus of each flange is 750mm^3, determine the maximum stress in a flange and also whether the stiffness will buckle or not. The thickness of the web is 2mm and second moment of area of a stiffener about an axis in the place of the web is 2000mm^4 and E = 70kN/mm^2. **(10 Marks)**

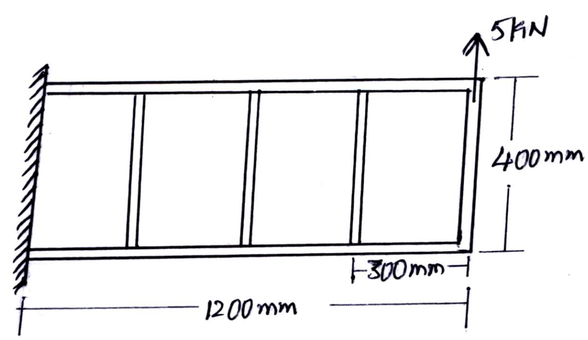

Fig.Q.8(a)

b. Explain pure bending of thin plate with neat sketches. **(10 Marks)**

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9 a. Write a note on Inflatable structures. **(03 Marks)**

b. Illustrate about the flying effector. **(03 Marks)**

c. Calculate the boom areas for the following wing section which is in the form of two-cell box, the vertical spars are connected to the wing skin through angle sections al having a cross-sectional areas of $300mm^2$. Idealize the section into an arrangement of direct stress carrying booms and shear stress carried by panels, suitable for bending moments in a vertical plane. (Refer Fig.Q.9(c)) **(14 Marks)**

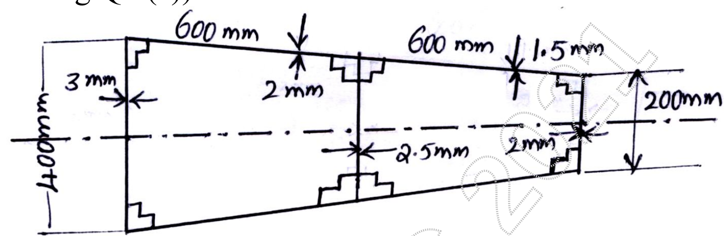

Fig.Q.9(c)

10 a. The fuselage section is subjected to a bending moment of 100kNm applied in the vertical plane of symmetry. If the section is completely idealized into a combination of direct stress carrying booms and shear stress only carrying panels. Determine the direct stress in each boom. (Refer Fig.Q.10(a)). **(10 Marks)**

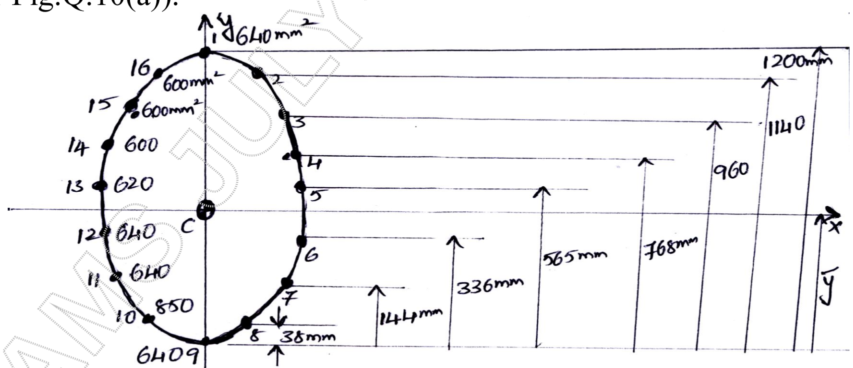

Fig.Q.10(a)

b. The wing section shown in following Fig.Q.10(b) has been idealized such that booms carry all the direct stresses. If the wing section is subjected to a bending moment of 300kN-m applied in a vertical plane, calculate the direct stress in the booms.

Boom areas are:

$B_1 = B_6 = 2580mm^2$

$B_2 = B_5 = 3880mm^2$

$B_3 = B_4 = 3230mm^2$

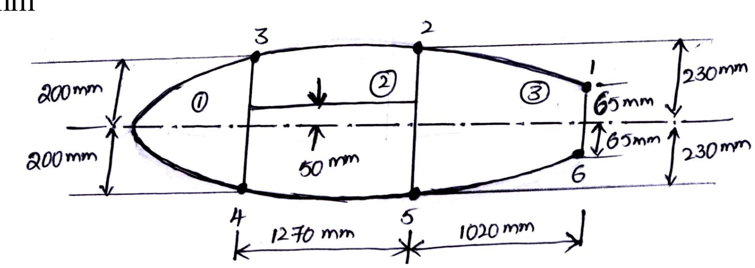

Fig.Q.10(b) **(10 Marks)**

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