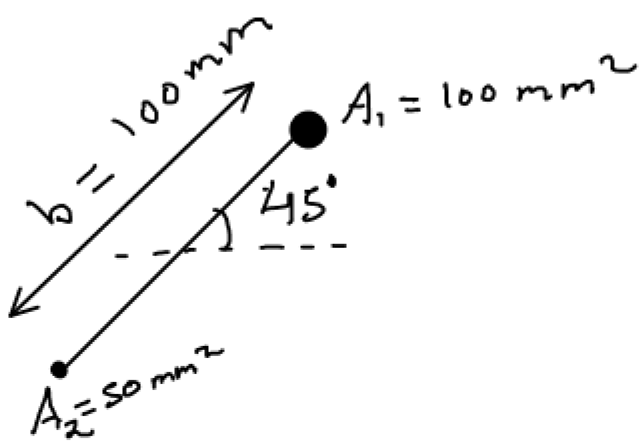
Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

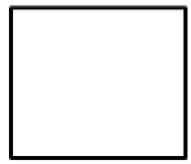
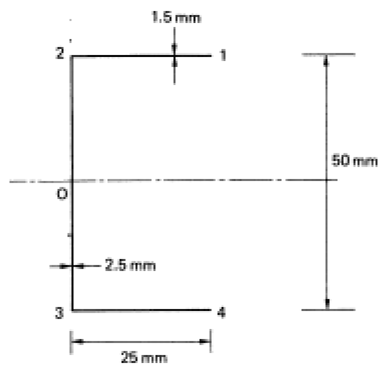
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

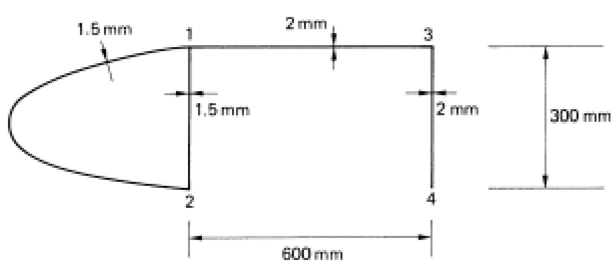
Course: Aircraft Structures-II **Semester: VI**
Program: B. Tech ASE **Time : 03 hrs.**
Course Code: ASEG 3013 **Max. Marks: 100**

Instructions: i) Assume any suitable value for missing data.
ii) Q1-Q3 are True/False

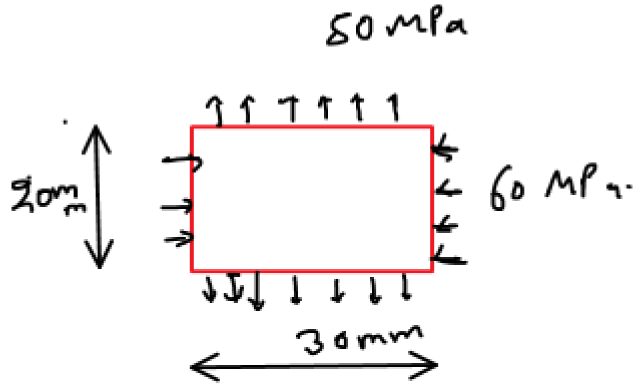
SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	a) For any arbitrary body undergoing mechanical deformation there 15 unknowns. (2 M) b) In case of pure torsion, shear stress is maximum for maximum thickness in thin walled open section beam. (2 M)	**4**	**CO1**
Q2	a) Bredt – Batho formula is applicable for only of open section beam. (2M) b) Moment of inertia of beam depends on the length of the beam..(2M)	**4**	**CO1**
Q3	a) The spar of wing carry both bending and shear stress. (2M) b) Neutral axis is coincide with centroid for symmetric and unsymmetrical beam under bending. (2M)	**4**	**CO1**
Q4	If an I section is idealized as shown in fig. below subjected a bending moment in vertical plane = 10 kNm. The maximum bending stress is? 	**4**	**CO2**

<table>
<tr><td>Q5</td><td>A square beam cross-section of side = 10 cm and thickness = 0.5 mm is subjected to torque T = 100 kNm, then the value of maximum shear stress is?
</td><td>4</td><td>CO2</td></tr>
<tr><td colspan="4">SECTION B
(4Qx10M= 40 Marks)</td></tr>
<tr><td>Q 6</td><td>Estimate the maximum shear stress in the channel section shown in fig. below, it is subjected to a counterclockwise torque of 10 Nm. G= 25,000 N/mm^2.

</td><td>10</td><td>CO3</td></tr>
<tr><td>Q7</td><td>Find the angle of twist per unit length in the wing whose cross-section is shown in fig. below, when it is subjected to a orque of 10 kN m. Find also the maximum shear stress in the section. G = 25,000 N/mm^2. Wall 12 length = 900 mm; nose cell area = 20000 mm

Note : Assume torsional rigidity (GJ) of combined section is equal to the sum of torsional rigidity of open and closed section and torque is equal on both open and closed section and Torque on open and closed section is same.

</td><td>10</td><td>CO3</td></tr>
<tr><td>Q8</td><td>Derive the formula to determin ethe shear stress distribution in thin wallled section.

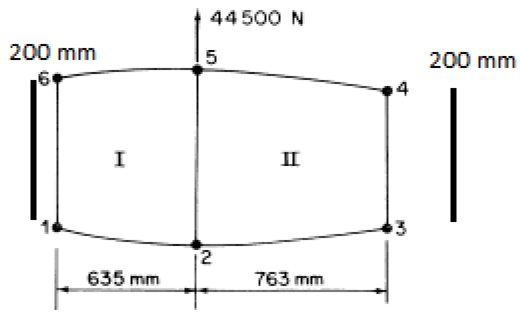
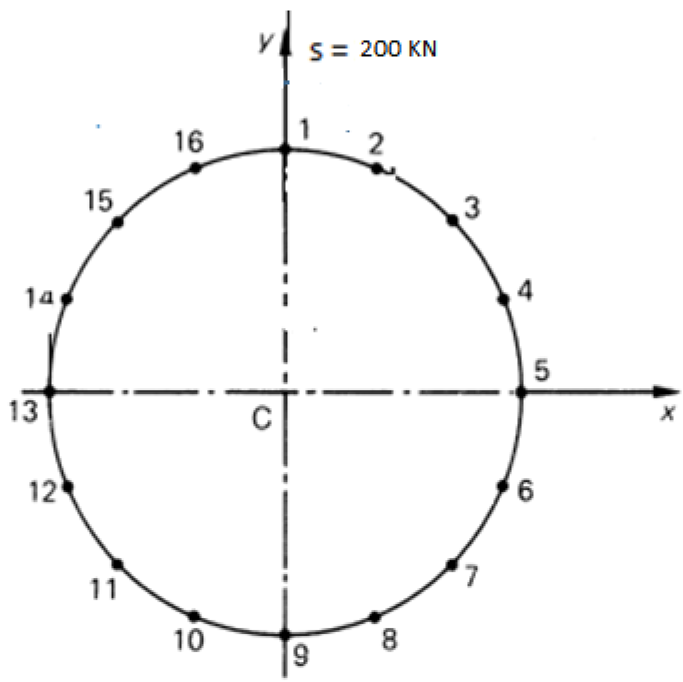
OR</td><td>10</td><td>CO2</td></tr>
</table>

	Diffrenece between symmetric and unsymmetric beam. Derive the formula to obtain bending stress in unsymmteric beam.		
Q9	A stress distribution on small element of thin panel is shown below, determine the change in the dimension of element, given the properties of element are E = 200 GPa, Poisson ratio = 0.3. 	**10**	**CO2**

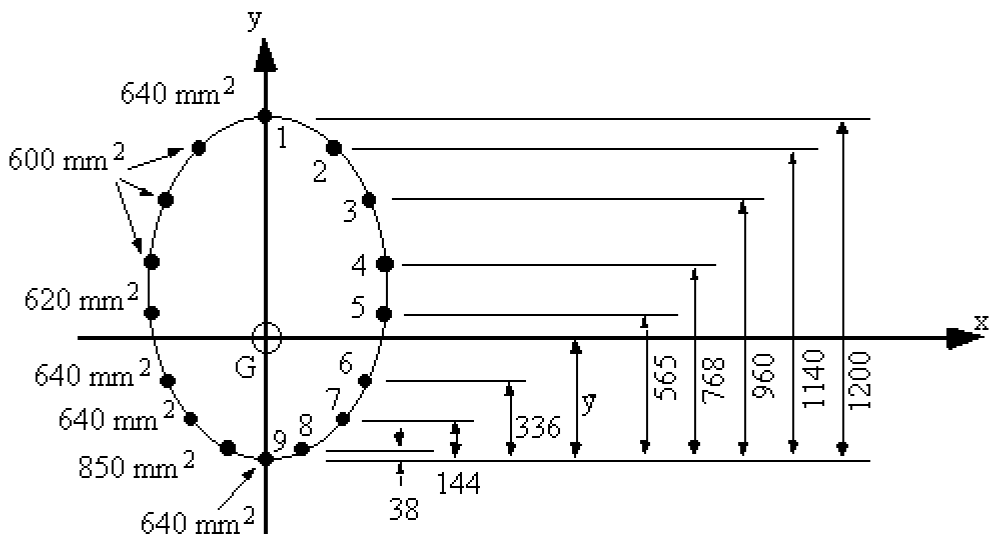
SECTION-C
(2Qx20M=40 Marks)

Q10	The idealized cross-section and its dimensions of a two-cell thin-walled wing box is shown in fig. and table below. If the wing box supports a load of 44,500 N acting along shear centre of the section, determine the shear flow distribution. The shear modulus G is the same for all walls of the wing box. The cell areas are A-I = 232,000 mm^2, A-II = 258,000 mm^2.	**20**	**CO4**

Wall	Length ,mm	Thickne ss	Boom	Area
16	254	1	1,6	1200
25	406	1	2,5	2000
34	202	1	3,4	645
12,56	647	1		
23,45	775	1		

<table>
<tr><td></td><td>
</td><td></td><td></td></tr>
<tr><td>Q11.</td><td>Apply the fuselage idealization theory., determine the shear flow distribution of the idealized fuselage section shown in Fig. below The fuselage is subjected to a shear of 200 KN, The radius of the fuselage is 200 mm. Booms are equally place over surface of fuselage and area of each boom == 100 mm^2 .


OR
Apply the fuselage idealization theory . if the singly symmetrical fuselage cross-Section is subjected to a bending moment M_x = 200 kNm. If all direct stresses are carried by the booms, determine the average direct stress in each boom.</td><td>20</td><td>CO4</td></tr>
</table>

	y
640 mm2
600 mm2
620 mm2
640 mm2
640 mm2
850 mm2
640 mm2
1
2
3
4
5
6
7
8
9
G
x
336
y
565
768
960
1140
1200
144
38		