Name:

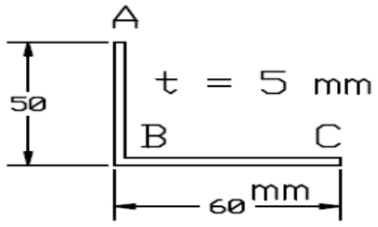
Enrolment No:

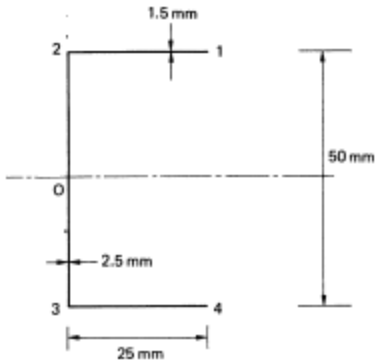
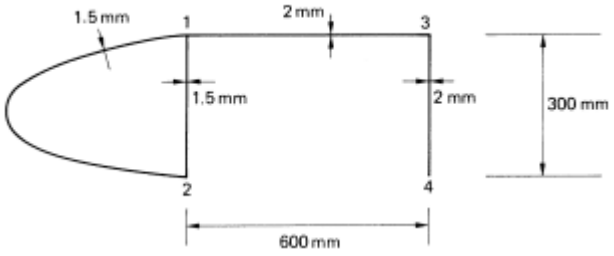
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

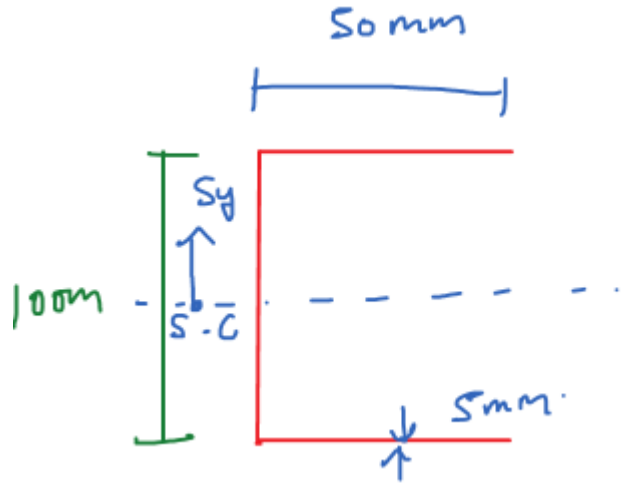
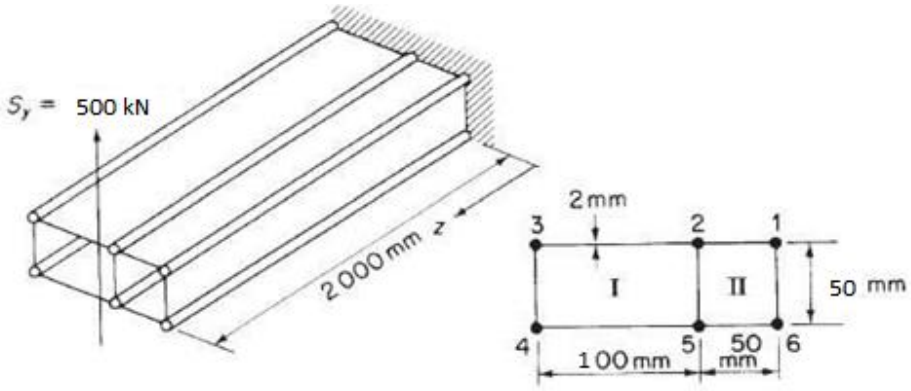
Course: Aircraft Structures-II **Semester: VI**
Program: B. Tech ASE + AVE **Time : 03 hrs.**
Course Code: ASEG 3017 **Max. Marks: 100**

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. b) Neutral axis is coincide with centroid for symmetric and unsymmetrical beam under bending.	**4**	**CO1**
Q4	A torque of 8 Nm is applied in clockwise (CW) direction to the bar cross section shown in, Fig. 1. Determine the maximum shear stress and the angle of twist per unit length. Take G = 80 GPa. 	**4**	**CO2**
Q5	A square beam cross-section of side = 10 cm and thickness = 0.5 mm is subjected to torque T = 100 kNm, the value of maximum shear stress is? 	**4**	**CO2**

SECTION B **(4Qx10M= 40 Marks)**			
Q 6	Determine the maximum shear stress in the channel section when it is subjected to a counterclockwise torque of 50 kNm. G= 25,000 N/mm^2  	**10**	**CO3**
Q7	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 torque 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 Hint: Assume torsional rigidity (GJ) combined section is equal to the sum of torsional rigidity of open and closed section and torque is equal on both open and closed  	**10**	**CO3**
Q8	Derive the formula to determin ethe shear stress distribution in thin wallled section. **OR** Diffrenece between symmetric and unsymmetric beam. Derive the formula to obtain bending stress in unsymmteric beam.	**10**	**CO3**
Q9	Determine the shear flow and shear center of the channel section shown below, let S_y = 100 kN.	**10**	**CO2**

			
	SECTION-C **(2Qx20M=40 Marks)**		
Q10	Apply the wind idealization theory, determine the shear flow of the two-cell beam shown in Fig. below. The booms carry all the direct stresses while the skin panels, of constant thickness throughout are effective only in shear. Take E = 70 000N/mm^2 and G = 25 000N/mm^2 Boom areas: B1 = B3 = B4 = B6 = 100mm^2 B2 = B5 = 500mm^2 Note: Shear load is acting at the junction two cells. 	**20**	**CO4**
Q11	Determine the shear flow distribution of the idealized fuselage section shown in Fig. 4. The fuselage is subjected to a shear load of 200 KN at point 13, The radius of the fuselage is 100 mm. Booms are equally place over surface of fuselage and area of each boom == 50 mm^2.	**20**	**CO4**

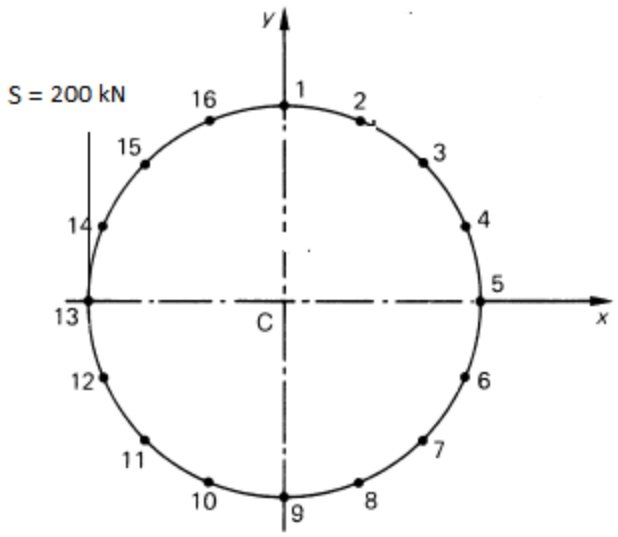


Fig. 4

OR

Apply the wing idealization theory, determine the shear flow distribution of idealized wing section as shown in Fig. below the wing is subjected to CCW torsion = 100 KN mm. Required data is provided in Table 1.

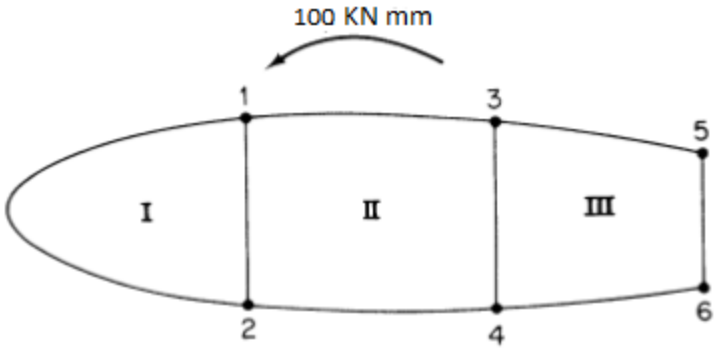


Table 1.

Wall	Length , mm	Thickness (mm)	G N/ mm^2	Cell area (mm
12 ^{0}	1500	1	30 000	A_I = 2000
12^i	500	1	30 000	A_{II} = 3000
13, 24	800	1	30 000	A_{III} = 2500
34	450	1	30 000	
35, 46	600	1	30 000	
56	400	1	30 000	