Name: **Enrolment No:**	

UPES

End Semester Examination, May 2024

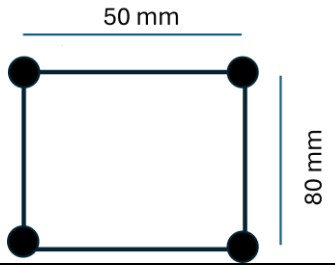
Course: Aircraft Structures-II **Semester: VI**

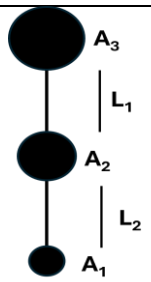
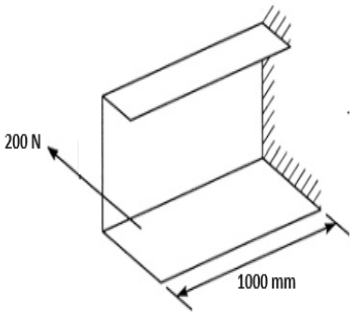
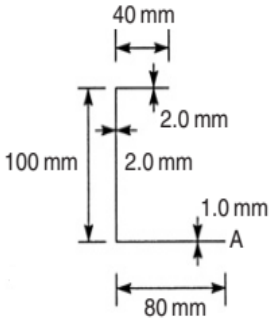
Program: B. Tech ASE **Time : 03 hrs.**

Course Code: ASEG 3021 **Max. Marks: 100**

Instructions: Assume any suitable value for the missing data

SECTION A
(5Qx4M=20Marks)

S. No.		**Marks**	**CO**
Q 1	**True/False**. a) Torsional modulus of thin walled section is proportional to the thickness cube of the cross-section. b) Booms in idealized cross-section carries only bending stress and not shear stress .	**4**	**CO1**
Q2	**True/False** a) Shear centre location is independent of intensity of load b) Shear flow distribution in an idealised fuselage cross-section will always has symmetry about both axis.	**4**	**CO1**
Q3	**True/False**. a) In pure torque maximum shear tress in thin walled open section is directly proportional to the thickness of section. b) Twist is zero in the cross-section if shear load passes through the shear centre.	**4**	**CO1**
Q4	Determine the maximum bending stress carried by the idealized section subjected to positive bending moment of 500KNm about the centroid of section. Take the area of each boom = 200 mm^2. 	**4**	**CO2**
Q5	An idelaised section subjected to the shear force of 100 KN, If the area of booms are, A_1= 50 mm^2 , A_2= 100 mm^2 and A_3= 150 mm^2, and L_1= L_2 = 50mm, the show the distribution of the shear flow if thickness = 1mm	**4**	**CO3**

			
SECTION B (4Qx10M= 40 Marks)			
Q 6	Consider two shaft one with thin walled of thickness 2 mm and radius 10 cm and other with solid cross-section of same radius subjected to same torque of 100 KN m, determine a) The ratio of maximum shear stress of both the same cross-section b) The raio of twist per init length Based on the obtained value comment on the the enginerring design aspect of shaft selection	**10**	**CO3**
Q7	At a particular point in a structural member a two-dimensional stress system exists where σ_x = 60 N/mm2, σ_y = -40 N/mm^2 and τ_{xy} = 50 N/mm^2. If Young's modulus E = 200 000 N/mm^2 and Poisson's ratio ν = 0.3 calculate the direct strain in the x and y directions and the shear strain at the point. Also calculate the principal strains at the point and their inclination to the plane on which σ_x acts;	**10**	**CO2**
Q8	State Bredt – Batho Thoery, and derive the expression for the twist per unit length in the thin walled closed cross-section under pure torque	**10**	**CO3**
Q9	A thin-walled, cantilever beam of unsymmetrical cross-section supports shear loads at its free end as shown in Fig. below. Calculate the value of direct stress (bending stress)at the extremity of the lower flange (point A)  	**10**	**CO4**
SECTION-C (2Qx20M=40 Marks)			
Q10	Determine and draw the shear flow distribution of idealized wing section as shown in Fig. below, the wing is subjected to CCW torsion = 500 KN m. Required data is provided in Table 1	**20**	**CO4**

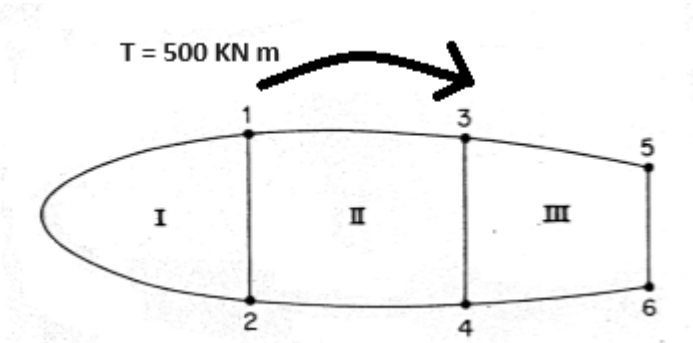


Table 1

Wall	Length , mm	Thickness (mm)	G N/ mm^2	Cell area (mm^2
12 ^{0}	1800	1	10 000	A_I = 5000
12^i	700	2	15 000	A_{II} = 8000
13, 24	1000	1	10 000	A_{III} = 6000
34	650	2	10 000	
35, 46	800	1	15 000	
56	600	2	15 000	

OR

Fig. below the idealized airfoil section, assuming the webs are ineffective in carrying bending, determine

a) Shear flow distribution
b) Shear center location

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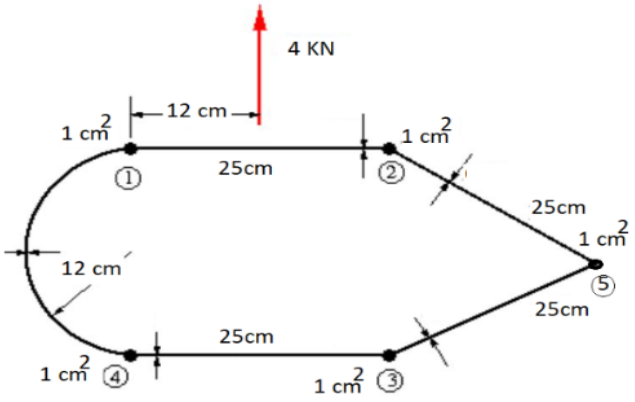

Q11	Consider a fuselage of of circular cross-section shown in fig. below subjected shear force = 200 Nm at distance of 25 mm from centre. The area of the	**20**	**CO4**

	stringers of L-cross-section are 100 mm^2. Idealized the fuselage in boom and skin and draw the shear flow distribution