U.S.N.										

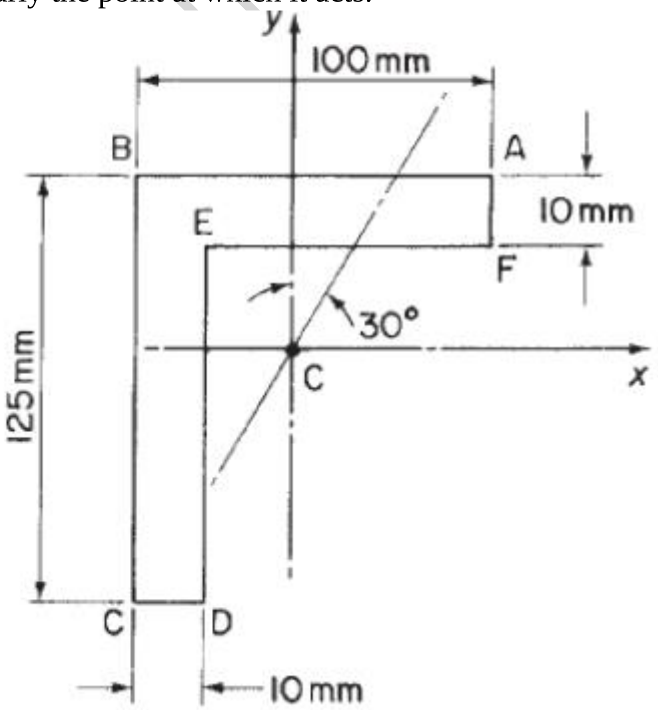
B.M.S. College of Engineering, Bengaluru-560019

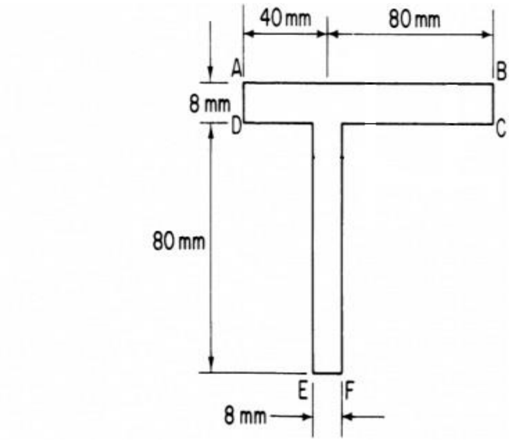
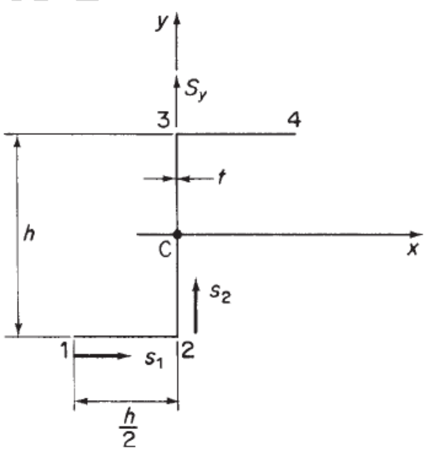
Autonomous Institute Affiliated to VTU

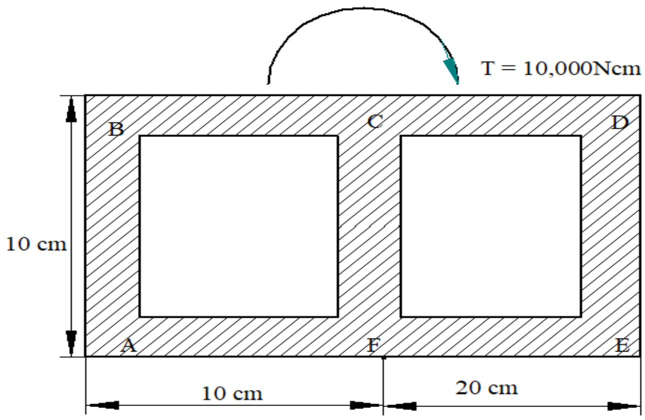
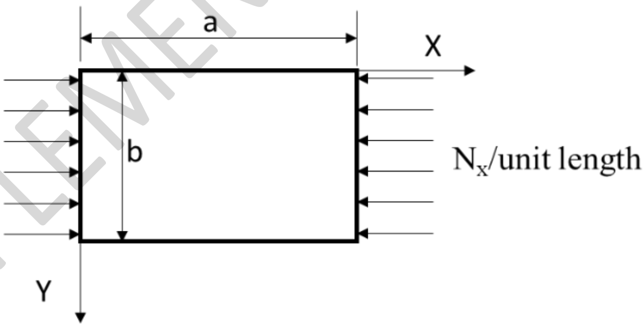
October 2024 Supplementary Examinations

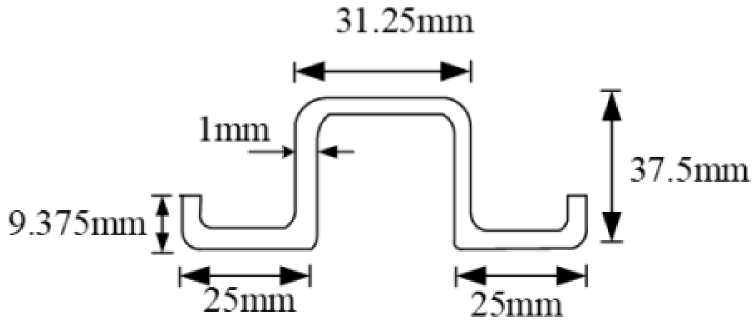
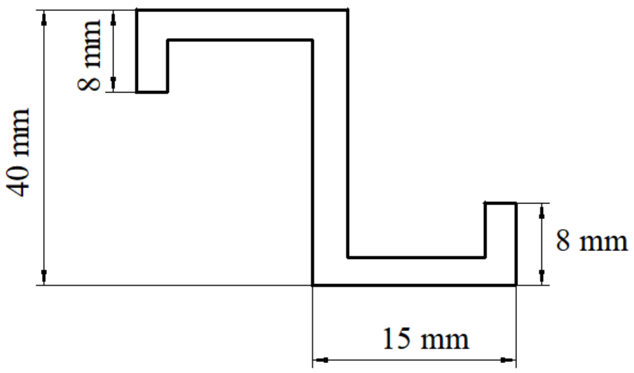
Programme: B.E. **Semester: VI**
Branch: Aerospace Engineering **Duration: 3 hrs.**
Course Code: 22AS6PCAST **Max Marks: 100**
Course: Aerospace Structures

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

		UNIT - I	*CO*	*PO*	**Marks**
1	a)	List basic structural members in aircraft structures and their functions.	1	1	**08**
	b)	Figure 1b shows the section of an angle purlin. A bending moment of 3000Nm is applied to the purlin in a plane at an angle of 30◦ to the vertical y axis. If the sense of the bending moment is such that its components Mx and My both produce tension in the positive xy quadrant, calculate the maximum direct stress in the purlin stating clearly the point at which it acts.  Figure 1b	1	2	**12**
		OR			

	2	a)	Explain the following a)Anticlastic bending b)Product of second moment of area. c)Semi-monocoque d)Shear stress e)Shear flow f)Shear center	*1*	*1*	**6**
		b)	A beam having the cross-section shown in figure 2b is subjected to a bending moment of 1,500 Nm in a vertical plane. Calculate the maximum direct stress due to bending stating the point at which it acts  Figure 2b	*1*	*2*	**14**
			UNIT - II			
	3	a)	Derive the equation of shear flow for the open thin walled section.	*2*	*2*	**10**
		b)	Determine the shear flow distribution in the thin-walled Z-section shown in Figure 3b due to a shear load Sy applied through the shear centre of the section.  Figure 3b	*2*	*2*	**10**
			UNIT - III			
	4	a)	Explain breifly about Bredt Batho theory.	*3*	*2*	**8**
		b)	Find the shear flow and twist per unit length of two tube structure as shown in Figure 4b ,Take G = 25 X 10^5 N/cm^2 and thickness t = 0.1 mm.	*3*	*2*	**12**

			 Figure 4b			
			UNIT - IV			
5	a)		A thin rectangular plate of side a and b (parallel to x & y -axis respectively) and thickness t is simply supported opposite edges and unload edges are free, and has a slight initial curvature giving an initial deflected shape. $$w=\sum_{m=1}^{\infty}\sum_{n=1}^{\infty}A_{mn}\sin\frac{m\pi x}{a}\sin\frac{n\pi y}{b}$$ If the plate is subjected to a uniform compressive stress σ in the x-direction, find an approximate expression for the magnitude of the stress σ which causes the plate to buckle.  Figure 5a	4	2	**10**
	b)		Calculate the crippling strength for the given formed section shown in the figure 5b using Needham's method. Assume E=75 GPa and the yield stress is 280 MPa. Thickness of the section is 1.0 mm and Total Area = 1.75 cm^2.	4	2	**10**

			 Figure 5b			
			OR			
	6	a)	Derive an expression for the buckling load of plate subjected to a compressive load N_x on four side and the unloaded edges are free.	4	2	**15**
		b)	Calculate the crippling stress for the given extrusion section shown in the figure 6b using the Gerard method. Assume E=75GPa and the yield stress is 280 Mpa. Thickness of the section is 1.5 mm.  Figure 6b	4	2	**05**
			UNIT - V			
	7	a)	The fuselage section shown in figure 7a is subjected to a bending moment of 100 kNm applied in the vertical plane of symmetry, if the section is idealized determine the direct stress in each point.	5	2	**10**

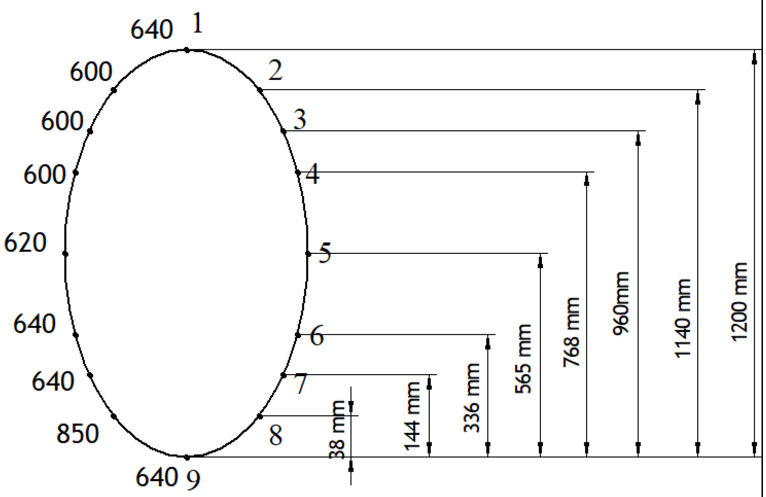
<table>
<tr><td></td><td></td><td></td><td>

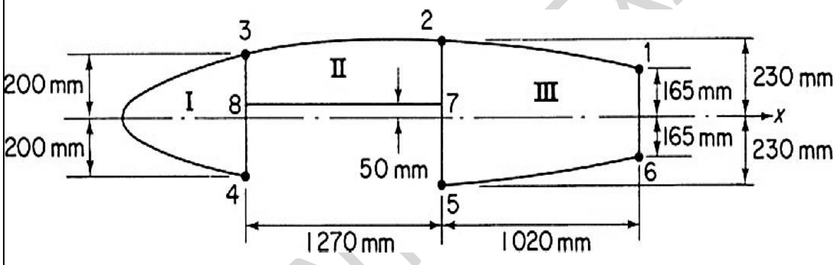
Figure 7a</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>b)</td><td>The wing section shown in Fig 7b. has been idealized such that the booms carry all the direct stresses. If the wing section is subjected to a bending moment of 300 kNm applied in a vertical plane, calculate the direct stresses in the booms. B1=B6=2580 mm^2, B2=B5=3880 mm^2, B3=B4=3230 mm^2


Figure 7b</td><td>5</td><td>2</td><td>10</td></tr>
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