U.S.N.										

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

Autonomous Institute Affiliated to VTU

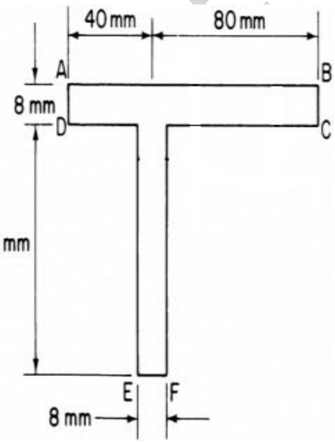
July 2023 Semester End Main Examinations

Programme: B.E. | **Semester: VI**
Branch: Aerospace Engineering | **Duration: 3 hrs.**
Course Code: 20AE6DCAST | **Max Marks: 100**
Course: Aerospace Structures | **Date: 22.07.2023**

Instructions:

1. Draw figures wherever necessary.
2. Assume suitable data wherever necessary.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	*CO*	*PO*	**Marks**
1	a)	Explain the following i. Parallel axis theorem ii. Perpendicular axis theorem iii. Neutral axis	*CO1*	*PO1*	**6**
	b)	A beam having the cross-section shown in figure 1b is subjected to a bending moment of 1500 Nm in a vertical plane. Calculate the maximum direct stress due to bending stating the point at which it acts.  Figure 1b	*CO1*	*PO1* *PO2*	**14**
		UNIT - II			
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	*CO2*	*PO1*	**6**

		b)	Derive the equation of shear flow for the open thin-walled section.	CO2	PO PO2	**14**

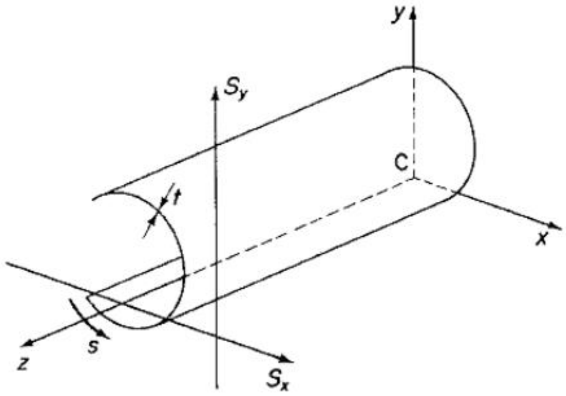


Figure 2b

			UNIT - III			
	3	a)	Explain briefly about Bredt Batho theory.	CO3	PO1 PO2	**8**
		b)	Find the shear flow and twist per unit length of two tube structure as shown in Figure 3b ,Take G = 25 X 10^5 N/cm^2 and thickness t = 0.1 mm	CO3	PO1 PO2	**12**

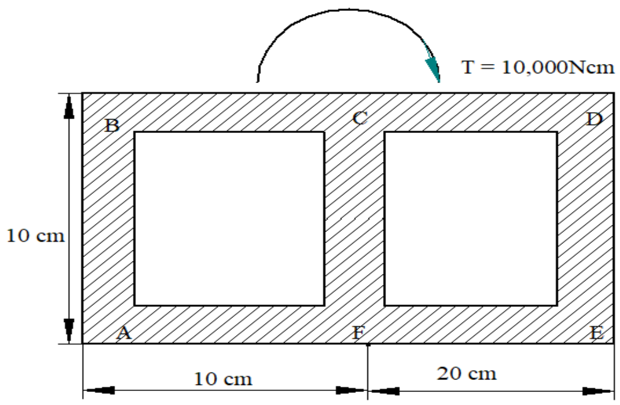


Figure 3b

			UNIT - IV			
	4	a)	Explain briefly about buckling on thin plates.	CO4	PO1 PO2	**5**
		b)	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.	CO4	PO1 PO2	**15**
			OR			
	5	a)	Briefly explain the Needham's and Gerard's methods for determining the crippling stresses.	CO4	PO1 PO2	**5**
		b)	A thin square plate of side *a* and thickness *t* is simply supported along each edge, and has a slight initial curvature giving an initial deflected shape. $$w_0 = \delta \sin \frac{\pi x}{a} \sin \frac{\pi y}{a}$$ If the plate is subjected to a uniform compressive stress σ in the *x*-direction (see	CO4	PO1 PO2	**15**

<table>
<tr><td></td><td></td><td></td><td>Fig (5b), find an expression for the elastic deflection w normal to the plate and also the deflection at the mid-point of the plate.

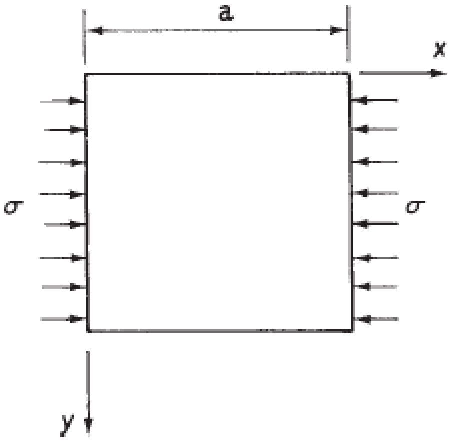


Figure 5b</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>UNIT - V</td><td></td><td></td><td></td></tr>
<tr><td></td><td>6</td><td>a)</td><td>The fuselage of a light passenger carrying aircraft has the circular cross-section shown in Fig. below. The cross sectional area of each stringer is $100 mm^2$ and the vertical distances given in Figure below are to the mid-line of the section wall at the corresponding stringer position. If the fuselage is subjected to a bending moment of 200 kNm applied in the vertical plane of symmetry, at this section, calculate the direct stress distribution.

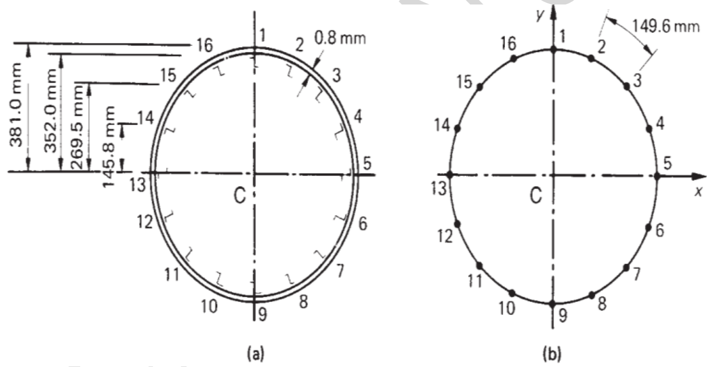


Figure 6a</td><td>CO5</td><td>PO1
PO2</td><td>12</td></tr>
<tr><td></td><td></td><td>b)</td><td>The fuselage section shown is subjected to a bending moment of 100 kNm applied in the vertical plane of symmetry, if the section is idealized determine the direct stress in each point.

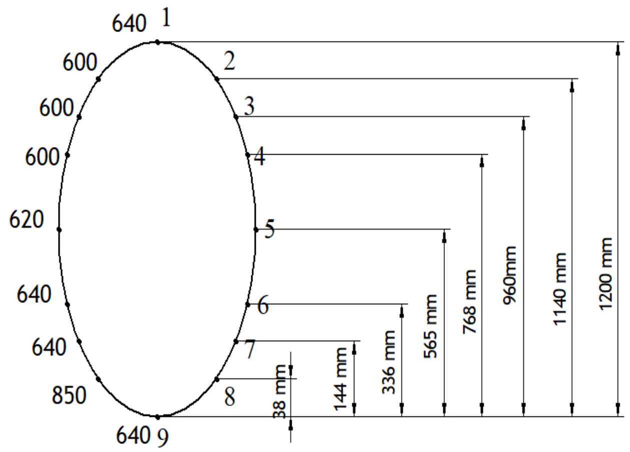
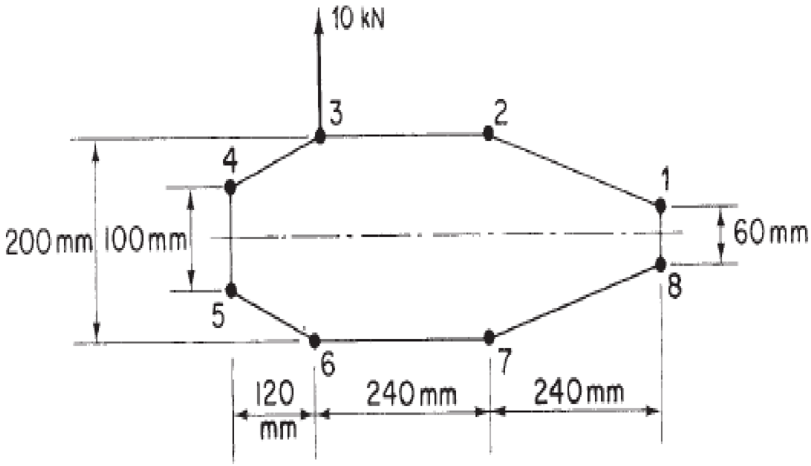
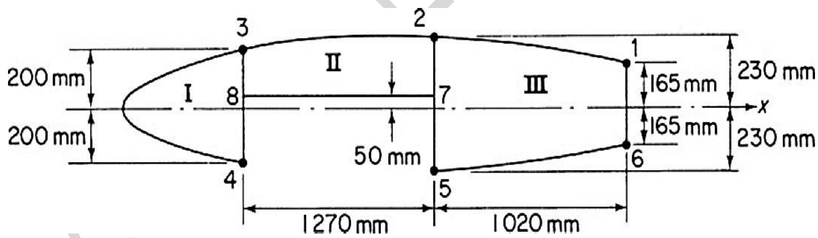


Figure 6b</td><td>CO5</td><td>PO1
PO2</td><td>08</td></tr>
</table>

			OR			
	7	a)	The thin-walled single cell beam shown in Figure 7a has been idealized into a combination of direct stress carrying booms and shear stress only carrying walls. If the section supports a vertical shear load of 10 KN acting in a vertical plane through booms 3 and 6, calculate the distribution of shear flow around the section. Boom areas: $B1 = B8 = 200$ mm^2, $B2 = B7 = 250$ mm^2, $B3 = B6 = 400$ mm^2, $B4 = B5 = 100$ mm^2.  Figure 7a	*CO5*	*PO1* *PO2*	**12**
		b)	The wing section shown in Figure 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.  Figure 7b	*CO5*	*PO1* *PO2*	**08**

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