Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) - EXAMINATION – SUMMER 2016

Subject Code:2150103 Date:09/05/2016

Subject Name:Aircraft Structures II

Time:02:30 PM to 05:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Sketch the structure of a fuselage and a wing of an aircraft in detail and explain each component in detail.	07
	(b)	Determine the deflection curve and maximum deflection in a cantilever beam loaded with a point load "P" at the tip. The section is rectangular and has width b=200 mm and depth h =150 mm. Span of the beam is 2.0 meters.	07
Q.2	**(a)**	Derive the equations for direct bending stress distribution. Also sketch the direct bending stress distribution of an I-section.	07
	(b)	For a displacement field $U=(x^2y+5z^2)I + (xy^2z+y^2)j + x^2y^2z^2 k$ Determine the strain tensor, rotation tensor and angle of rotation at point(2.-1,2)	07
		OR	
	(b)	The state of stress at point is given by $\sigma_x=20, \sigma_{y=}-10$, $\sigma_z=7$ Mpa and $T_{xy}=-6$, $\tau_{yz}=8$ $\tau_{zx}=10$Mpa, determine the principal stresses and principal directions.	07
Q.3.	**(a)**	Explain torsion of multi cell closed box beam.	07
	(b)	Derive the equation of torsion of rectangular strip.	07
		OR	
Q.3	**(a)**	Explain torsion of multi cell open section beams.	07
	(b)	A thin walled circular section beam has a diameter of 200mm and is 2m long; it is firmly restrained against rotation at each end. A concentrated torque of 40kN is applied to the beam at its mid span point. If the maximum shear stress in the beam is limited to 300n/mm^2 and the maximum angle of twist to 2^0. Calculate the minimum thickness of beam walls. Take G= 25000 N/mm^2	07
Q.4	**(a)**	Explain the significance of thin walled structures and take an example and prove that thin walled structures are a better option than solid section in terms of stiffness.	07
	(b)	State the differences between Stiffness and Flexibility Methods of Structural Analysis.	07
		OR	
Q.4	**(a)**	Analyze the beam as shown in Figure 1 using Stiffness Matrix Method. Take E = 200 x 10^3 N/mm^2 and I = 2 x 10^8 mm^4.	07

(b) Determine the shear center of the section shown in Figure 2. Explain each step. 07

Q.5. **(a)**

1. Define shear center and its significance. Give examples of locations of shear center in angle, T and plus sections. 07
2. Explain Neutral Axis with a neat sketch. Derive the formula for finding out the co-ordinates of Neutral Axis.

(b) The beam has an I-section. Beam is subjected to a negative bending moment of 120 kNm applied in a vertical plane. Determine the distribution of direct stress through the depth of the cross-section. The dimension of the I-section is as follows. Width of the flange = 200 mm, Width of the web = 20 mm, Depth of the flange = 20 mm. Depth of only the web (w/o flange) =320 mm. 07

OR

Q.5. **(a)** A cantilever beam has a point load of W at the tip. Determine the deflection curve if the section is asymmetric. 07

(b) Determine the shear flow of the section shown in Figure 3. Explain each step. 07

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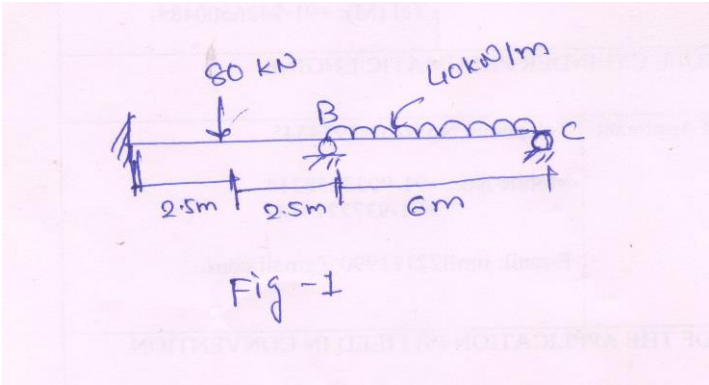

Fig -1

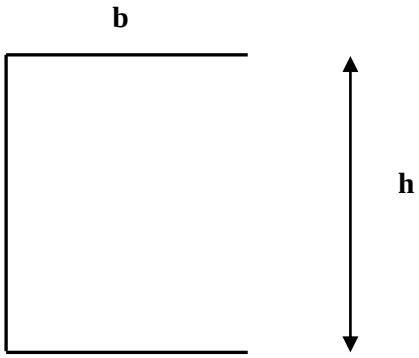

Fig-2

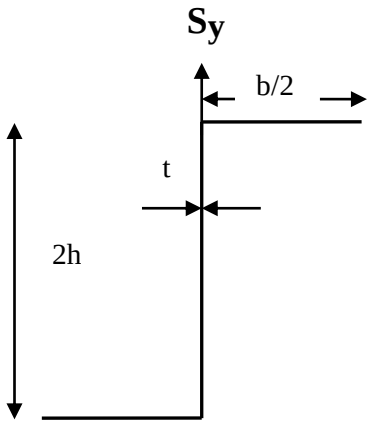

Fig-3

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