

Seat No.: _____

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GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (NEW) - EXAMINATION – SUMMER 2017****Subject Code: 2150103****Date: 01/05/2017****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.

		MARKS
Q.1	(a) Which of the following method is most suitable for computer programming _____? (Stiffness Matrix Method, Flexibility Matrix Method, Energy Method).	02
	(b) Action required to produce unit displacement is referred as _____ (Strain Energy, Stiffness, Flexibility)	02
	(c) Structures having only one dimension as the significant dimension are referred as _____ (Framed Structure, Continuum Structure, Rigid Structure)	02
	(d) The diagonal terms in a flexibility matrix are always _____ (>0, =0, <0)	02
	(e) The size of the stiffness matrix is _____ (SI x SI, KI x KI, SI x KI)	02
	(f) Which of the following method is referred as Force Method _____ (Stiffness Matrix Method, Flexibility Matrix Method, Energy Method)	02
	(g) Stiffness Method is matrix version of _____ method. (Conjugate Beam, Slope Deflection, Double Integration).	02
Q.2	(a) Enlist the different ways of making the section free from torsion.	03
	(b) Determine the stress fields that arises from the following stress function:	04
	(i) $\Phi = Cy^4$	
	(ii) $\Phi = Ax^2 + Bxy + Cy^3$	
	(iii) $\Phi = Ax^3 + Bx^2y + Cxy^2 + Dy^3$	
	(c) Explain Flight Envelope (V-n diagram) with the help of neat sketch.	07
	OR	
	(c) A thin walled circular section beam has a diameter of 200 mm and is 2 m long, it is firmly restrained against rotation at each end. A concentrated torque of 30 kN.m is applied to the beam at its midspan point. If the maximum shear stress is limited to 200 N/mm ² and the maximum angle of twist is 2°, calculate the minimum thickness of beam walls. Take $G = 25000 \text{ N/mm}^2$.	07
Q.3	(a) State the difference between Symmetrical Bending and Unsymmetrical Bending.	03
	(b) Explain with neat sketch the state of stress at a point in three dimensions.	04
	(c) Calculate the value of reactions for the continuous beam shown in Figure-1 using Stiffness System Approach.	07
	OR	
Q.3	(a) Define the terms: Unsymmetrical Bending, Neutral Axis	03

- (b) Explain the State of Plane Stress 04
 (c) Determine the value of the redundants for the beam shown in the Figure-2 using Flexibility Method. Consider redundants in the form of moments. 07
- Q.4** (a) Define Flexibility and state the characteristics of Flexibility Matrix. 03
 (b) Enlist the basic equations of equilibrium, compatibility and stress-strain relations for plane stress condition in polar coordinate system 04
 (c) Find the reactions for the beam shown in Figure-3 using Displacement Method. Assume that the beam has constant flexural rigidity EI. 07

OR

- Q.4** (a) Explain torsion of multi cell open section beams. 03
 (b) Explain Framed Structures and Continuum Structures with the help of neat sketch. 04
 (c) Analyse the propped cantilever beam shown in Figure-4 by Flexibility method. Calculate the redundant using unit load method. 07
- Q.5** (a) Define the terms: Shear Centre, Shear Flow 03
 (b) Derive the equation of torque for a bar from Prandtl Stress Function 04
 (c) An Indian Standard I-section ISMB 300 is shown in Figure- 5. The properties of the section are as below: $I_{xx} = 7719 \text{ cm}^4$, $I_{yy} = 456 \text{ cm}^4$. The plane of loading is inclined at 30° to the Y-axis. Find moment 'M' if the maximum bending stress induced is 120 N/mm^2 . 07

OR

- Q.5** (a) Define: Principal Centroidal Axis 03
 (b) Prove that the "Product of Stiffness Matrix and Flexibility Matrix is Unity". 04
 (c) Determine the position of the shear centre for the thin-walled open section shown in Figure-6. Moment of Inertia of the section $I_u = 1070 \times 10^6 \text{ mm}^4$. 07

