

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (OLD) - EXAMINATION – SUMMER 2017****Subject Code: 150103****Date: 01/05/2017****Subject Name: Aircraft Structure-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) State the difference between strain energy and complimentary strain energy. **03**
 (b) Prove that, flexibility and stiffness are inversely proportional to each other. **05**
 (C) Suggest different way of making the section free from torsion along with suitable justification. **03**
- Q.2** (a) Analyze the beam as shown in fig.1 using Stiffness Matrix Method. Take $E = 210 \times 10^3 \text{ N/mm}^2$ and $I = 2.2 \times 10^8 \text{ mm}^4$. **07**
 (b) Find the support reaction for a Frame as shown in fig.2 using Stiffness Matrix Method if the rotation at joint 'B' is 0.000060 rad clockwise. Neglect the axial deformation in the member. Take $E = 200 \times 10^3 \text{ N/mm}^2$ and $I = 80 \times 10^3 \text{ mm}^4$. **07**
- OR**
- (b) Obtain the global stiffness matrix for a single truss member by showing proper derivation. **07**
- Q.3** (a) State the difference between Stiffness and Flexibility Methods of Structural Analysis. **04**
 (b) A 5 m long simply supported beam is subjected to a u.d.l. of 12 kN/m intensity throughout the length of a beam. Find the support reaction using Flexibility Matrix Method. **10**
- OR**
- Q.3** (a) Enlist the properties of Stiffness Matrix. **04**
 (b) Find the support reaction for a frame as shown in fig.-3 using Flexibility Matrix Method. **10**
- Q.4** (a) State the difference between symmetrical and Unsymmetrical Bending. **04**
 (b) Locate the Shear Centre of a section as shown in fig.-4. Also draw the shear flow and shear stress distribution diagram. **10**
- OR**
- Q.4** (a) Derive the equation to locate the Neutral Axis of the section subjected to unsymmetrical bending. **07**
 (b) At a point in a body subjected to a three dimensional forces, the state of stress is define as $\sigma_{xx} = 200 \text{ N/mm}^2$, $\sigma_{yy} = -100 \text{ N/mm}^2$, $\sigma_{zz} = -100 \text{ N/mm}^2$ and the shear stresses $T_{xy} = T_{yz} = T_{zx} = 200 \text{ N/mm}^2$. Compute the normal, Shearing and Resultant stresses on a plane that is equally inclined to all the three principal axes. **07**
- Q.5** (a) Derive an equation of a Castiglione's force theorem $F = \partial U / \partial \Delta$ with usual notation. **07**
 (b) Find the internal forces in a truss member as shown in Fig.-5 using Castiglione's theorem. All the members have same cross sectional areas. **07**
- OR**
- Q.5** (a) Explain Theorem of least work. Explain its application in structural analysis by giving suitable example. **07**

- (b) For a truss as shown in fig.-6, determine the horizontal deflection at point 'B' using any suitable method. Take $A = 0.001 \text{ m}^2$, $E = 2 \times 10^5 \text{ N/m}^2$. 07

