

GUJARAT TECHNOLOGICAL UNIVERSITY**M.E. SEMESTER I (old course)–EXAMINATION (Remedial) – WINTER 2015****Subject code: 712001N****Date: 08/12/2015****Subject Name: Advanced Structural Analysis****Time: 10:30 AM to 1:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks. p
4. Take $E = 2 \times 10^8 \text{ kN/m}^2$, $I = 0.005 \text{ m}^4$, $A_x = 0.02 \text{ m}^2$, $J = 0.010 \text{ m}^4$, $G = 0.8 \times 10^8 \text{ kN/m}^2$ unless and otherwise given.

- Q.1** (a) Explain basic principles of sub structuring and its merits. **07**
 (b) What is nonlinearity? How the structure can be analyzed for elastic nonlinearity? **07**

- Q.2** (a) Write member stiffness matrix for a space truss in member oriented axis and structural oriented axis. **07**
 (b) Construct joint stiffness matrix for a plane frame as shown in **figure 1**. **07**
 Member 1 is a plane frame member and Member 2 is a plane truss member.
 Take $\frac{AE}{L} = \frac{2EI}{L^3}$

OR

- (b) For a grid shown in **figure 2** obtain rearranged joint stiffness matrix. **07**
- Q.3** (a) Analyze the beam shown in **figure 3** using Stiffness method-member approach. **07**

OR

- Q.3** (a) Analyze the beam shown in **figure 3** using Flexibility method-member approach. **07**

- Q.4** (a) Analyze the Plane truss shown in **figure 4** using Stiffness method-member approach. **14**

OR

- Q.4** (a) Analyze the plane truss shown in **figure 4** using Flexibility method-member approach. **14**

- Q.5** (a) Explain the concept of rotation of axes in two dimensions. **07**
 (b) Derive flexibility matrix for the structure shown below in **figure 5** for given structural Coordinates. EI is constant **07**

OR

- Q.5** (a) What are the different storage techniques for large size problems? Explain any one in detail. **07**
 (b) Obtain rearrange joint stiffness matrix for a beam as shown in **figure 6**. **07**

