GUJARAT TECHNOLOGICAL UNIVERSITY PDDC-SEMESTER VII- • EXAMINATION - SUMMER - 2016

Subject Code: X-70606 Subject Name: Advanced Structural Analysis Time:10:30 AM to 1:00 PM

Date: 18/11/2016

Total Marks: 70

Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- 4. Take E=2x10⁸ kN/m²,I=2.0x10⁻⁵ m⁴ ,A=0.0025 m²,G=0.8x10⁸ kN/m² and $J=4.0 \times 10^{-5} \text{ m}^4$ if not given.
- Analyse a beam shown in the fig.1 using stiffness member approach and plot 14 **Q.1** SF & BM diagrams. Explain how effect of support sinking is considered for the solution.
- **Q.2** 07 (a) Enlist steps evolved in FEM analysis and explain any one in detail.
 - Explain symmetry and anti-symmetry giving example of various structures **(b)** 07 and illustrative sketches.

OR

- Enlist different pre and post processing facilities available in the structural 07 **(b)** analysis professional software you have learned.
- Find forces in the members of a truss shown in fig.2using stiffness member 0.3 (a) 07 approach. All members are of same cross sectional area 1000 mm² and $AE=2X10^5$ kN/m².Use of symmetry is permitted.
 - (b) Determine the elements of the stiffness matrix for a grid member. 07 OR
- Analyse a plane frame shown in fig.3 using stiffness member approach and 14 Q.3 construct BM diagram.
- **Q.4** Prepare an input file input in to store data of $n \ge n \le S_{FF}^{-1}$ matrix and 14 column vector A_{FC}.Write C or C++ programme to read above data and containing function capable to handle the multiplication of these matrices and store result as D_F vector. Write sample input file giving example.

OR

- Enlist different loading facilities normally available in the professional **Q.4** 07 (a) structural analysis software. Describe any two loading facilities in detail.
 - What is non linearity? Explain Geometrical, Material and Loading non **(b)** 07 linearity giving appropriate examples.
- (a) Using normal coordinate system determine the shape functions for the 0.5 07 Constant Strain Triangle.
 - (b) Derive Stiffness Matrix for two noded beam element using finite 07 element method.

OR

0.5 (a) Using FEM, determine nodal displacements and stresses in elements for the 14 Mild Steel bar assembly shown in the fig.4.





Fig.2 Q.3(a)



Fig.3 Q.3(a)



Fig.4 Q.5 OR