## GUJARAT TECHNOLOGICAL UNIVERSITY BE – SEMESTER-VII- EXAMINATION –SUMMER-2014

| Subject Code: 170605 Date: 31-05- |  |   | 2014     |  |
|-----------------------------------|--|---|----------|--|
| Tir                               | Subject Name: Advanced Structural AnalysisTotal Marks: 7Time:02:30pm-05:00pmTotal Marks: 7Instructions:1. Attempt all questions. |   | )        |  |
|                                   | 2.<br>3.   | Make suitable assumptions wherever necessary.<br>Figures to the right indicate full marks.  |          |  |
| Q.1                               | <b>(a)</b>   | What is non linearity? Explain Geometrical, Material and Loading non linearity giving appropriate examples.   | 07       |  |
|                                   | (b)  | Enlist various steps involved in solution of problem using Finite Element<br>Method and Explain Discretization in details.  | 07       |  |
| Q.2                               | <b>(a)</b>   | Determine the Shape functions for Constant Strain Triangle. Use natural Co-<br>ordinate Systems.  | 07       |  |
|                                   | <b>(b)</b>   | Explain "Incremental Analysis with Iteration" technique.<br>OR  | 07       |  |
|                                   | (b)  | Derive the relation for Action or Displacement vector on member axis and<br>Structure axis for Plane frame  | 07       |  |
| Q.3                               |  | Analyse the non prismatic fixed beam shown in <b>fig-1</b> by the Stiffness Matrix method using member approach. Find the force and displacement responses. Draw S.F and B.M diagrams. Take EI=80000kNm <sup>2</sup>  | 14       |  |
| Q.3                               |  | OR<br>Analyse the three span beam shown in <b>fig-2</b> by the Stiffness Matrix method<br>using member approach. Draw B.M diagram. Assume constant flexural rigidity,<br>EI. Use of Symmetry is permitted.  | 14       |  |
| Q.4                               | (a)  | Analyse the three Bar Assembly shown in <b>fig-3</b> by the Stiffness Matrix method using member approach. Find the support reaction and bar forces. Take $A=6cm^2$ for each bar.   | 07       |  |
|                                   | (b)  | Derive the Shape functions for four Noded Quadrilateral elements.   | 07       |  |
| Q.4                               | (a)<br>(b)   | Explain "Beam with Elastic Supports" in details<br>Analyse the truss shown in <b>fig-4</b> by the Stiffness Matrix method using member<br>approach. find joint displacements, support reactions, bar forces and bar<br>elongations. Take EA=6000kN for each bar | 04<br>10 |  |
| Q.5                               | (a)  | Analyse the truss shown in <b>fig-5</b> by Stiffness Matrix method using member approach. Find support reactions, bar forces. Take $AE=60x10^3$ kN.Use of symmetry is permitted.  | 07       |  |
|                                   | (b)  | Analyse the frame shown in <b>fig-6</b> by Stiffness Matrix member approach. Draw<br>free body diagram of frame, Take AE=8000kN,EI=20000kNm <sup>2</sup><br><b>OR</b>   | 07       |  |
| Q.5                               | ( <b>a</b> )   | Analyse the portal frame shown in <b>fig-7</b> by the Stiffness Matrix method using member approach. Consider the effect of indirect loading in the form of a   | 14       |  |

settlement of 10mm at the support D. Take  $E=2.5 \times 10^4 \text{ N/mm}^2$  Find the complete force response and draw B.M diagrams.

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