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BIMEE-013

B.Tech. MECHANICAL ENGINEERING (BTMEVI)

Term-End Examination

00633

June, 2018

BIMEE-013 : FINITE ELEMENT ANALYSIS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. All questions carry equal marks. Use of scientific calculator is permitted.*

1. Discuss in detail about the concepts of FEM formulation. How is it that the FEM emerged as a powerful tool ? Discuss major applications of FEM. *14*

2. (a) How do you formulate a frame element that would be able to model a buckling problem ? Explain. *7*

(b) Discuss about Isoparametric elements. Describe its features and characteristics. *7*

3. (a) Derive the stiffness matrix for a spring element consisting of 2 nodes (as shown in figure 1) with a single degree of freedom (axial deflection) at each node. *7*

Figure 1

(b) Distinguish between the following : 7

(i) Cartesian co-ordinate and Natural co-ordinate systems

(ii) Static analysis and Dynamic analysis

4. (a) Compare the variational and weighted residual methods in detail. 7

(b) What do you understand by finite element model ? Explain modelling of mechanical components with a suitable example. 7

5. Figure 2 shows a truss consisting of three elements with $\frac{EA}{L}$ value of each as 1000 N/mm. Calculate the deflection at node 2. All dimensions are in mm . 14

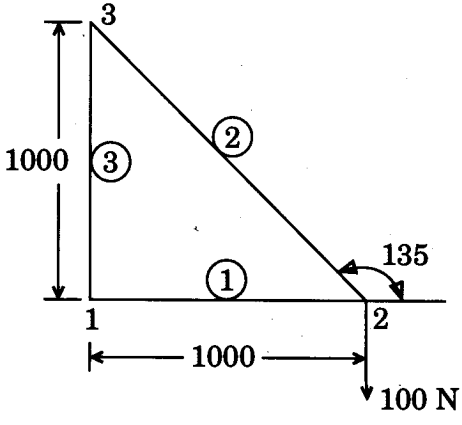

Figure 2

6. (a) Develop stiffness matrix equation and shape functions for an axi-symmetric triangular element. 7

(b) What is connectivity in finite element models ? Explain with a suitable example. 7

7. Write short notes on any ***four*** of the following : $4 \times 3\frac{1}{2} = 14$

(a) Dimensionability

(b) Galerkin approach

(c) Truss and frame

(d) Boundary condition

(e) Shape function

(f) FEA software packages