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BIMEE-013

B.Tech. MECHANICAL ENGINEERING (BTMEVI)

00214

Term-End Examination
June, 2014

BIMEE-013 : FINITE ELEMENT ANALYSIS

Time : 3 hours *Maximum Marks : 70*

Note : *(i) **All** questions carry **equal** marks;*
*(ii) Attempt **any five** questions, standard notations and symbols have usual meaning.*

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1. Discuss at length a general procedure used in FEA and describe steps in pre - processing, solution and post - processing. **14**

2. (a) Enumerate the seven typical steps used in finite element method. Briefly define each one of them. **7**

(b) Describe different types of shape primitive used in defining 1D, 2D and 3D elements. **7**

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

(b) Develop stress strain matrix equation and strain displacement matrix for an axi - symmetric triangular element. **7**

4. (a) Distinguish between : **7**

(i) Essential boundary condition and natural boundary condition and

(ii) Boundary value problem and initial value problem

(b) How can a three dimensional problem be reduced to a two dimensional approach ? Explain in detail. 7

5. A horizontal bar fixed at one end is heated uniformly to raise temperature to T°C. Determine the thermal stresses in a bar. Consider the length of the bar as L, cross section as A, Young's modulus E, thermal coefficient of thermal expansion as α and density ρ. 14

6. For a stepped bar as shown in Fig - 1, determine the stiffness equation and solve it for the angle of twist at point A and B. 14

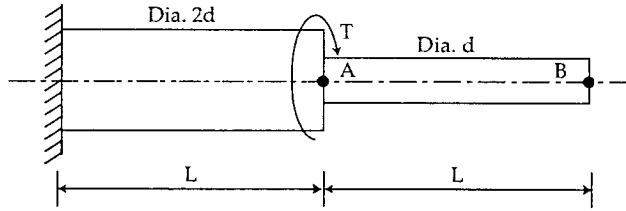

Fig - 1

7. Answer the following (**any three**) : 14

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

(b) Derive the stiffness matrix for CST element.

(c) How would you formulate a frame element that would be able to model a buckling problem ? Describe.

(d) The weight factors of 1-D Gausian Quadrature sum up to 2. Comment.