

2006 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

IV B.TECH II SEMESTER DEGREE EXAMINATIONS

FINITI ELEMENT METHODS

(PRODUCTION ENGINEERING AND MECHANICAL ENGINEERING)

APRIL/MAY 2006

**TIME : 3 HOUR
MARK : 80**

Answer any FIVE Questions All Questions carry equal marks

1. Write notes on the following:

(a) Weighted Residual method.

(b) Initial and Boundary value problems.

2. With a suitable example explain the formulation of finite element equations by direct approach. Assume suitable data for the example. Use I-D analysis.

3. Define and derive the Hermite shape functions for a two noded beam element?

4. (a) Show that the value of the shape function N_1 of node i and node k of a simplex triangular element is zero and at node I is one.

(b) The (x, y) coordinates of the nodes i, j and k of a triangular element are $(1, 1)$, $(4, 2)$ and $(3, 5)$ respectively. The shape functions of a point P located inside the element are given by $N_1 = 0.15$ and $N_2 = 0.25$. Determine the x and y coordinates of the point P .

5. Derive the conductivity matrix and vector for the 2-D element when one of the faces is exposed to a heat transfer coefficient of h at $T/$ and with internal heat generation of q W/m³.

6. Explain the following with examples.

(a) Lumped parameter model.

(b) Continuous system model.

7. Write a procedure for model creation and mesh generation for aerofoil shape turbine blades.

8. Give the necessity of rotating and offsetting the work plane in ANSYS environment. What are the useful features of CAEFEM package in analysis?

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