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2005 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

IV B.TECH II SEMESTER SUPPLEMENTARY EXAMINATIONS
FINITE ELEMENT METHODS
(AERONAUTICAL ENGINEERING)

JULY- 2005

TIME: 3 HOURS

MAX MARKS: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. Explain various types of boundary conditions encountered in the finite element analysis of structural problems.

2. (a) What is displacement function?
(b) Derive stresses and strains relations.
(c) Derive equivalent nodal force vectors.

3. Derive the elemental stiffness matrix for two noded beam element and also load vector.

4. Explain the procedure adapted for deriving the stiffness matrix for a three nodded triangular element in plane strain problem.

5. (a) What is meant by constant strain triangle element ? What are its advantages and disadvantages?
(b) How the properties of isoparametric elements are formulated? Explain with the use of the mathematical modeling.

6. A large industrial furnace is supported on a long column of fire clay brick, which is 1 X 1 m on a side .During steady state operation, installation is such that three surfaces of the column are maintained at 600 K, while the remaining surface is exposed to an air stream for which T = 300 K and h = 12 W/m2k . Determine the temperature distribution in the column and the heat rate to the air stream per unit length of column. Take K= 1 W/mk.

7. (a) Explain Eigen value problems.
(b) Derive the consistent mass matrix for a four d.o.f axial bar element.

8. Write the subroutines to compute the shape functions and Jacobian matrix [J] at a given Gauss point for a four noded quadrilateral element. U sing these subroutines develop a subroutine to compute the [B] matrix for a four noded isoparametric quadrilateral element using the formulation for fast stiffness computation.