Code: 9A21701

R09

B.Tech IV Year I Semester (R09) Supplementary Examinations, May 2013
FINITE ELEMENT AND MODELING METHODS
(Aeronautical Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1   (a)   What is the importance of substructures and super modules, accuracy and complexity
and degrees of freedom?
    (b)   Explain macro and micro mechanical views of "the finite elements".

2   (a)   Derive an expression relating local and global coordinates.
    (b)   Explain the advantages of natural coordinates over other coordinates.

3   (a)   Write the properties of the stiffness matrix (K) for linear ID problem.
    (b)   Find the shape functions of the one dimensional, 2 noded bar element.

4   (a)   What is meant by principle of minimum potential energy? Explain for a simple spring
mass system.
    (b)   Derive the stiffness property of a 1-dimensional line element on the energy basis.

5   (a)   What are the assumptions made in solving the fracture mechanics problems in finite
element methods?
    (b)   Explain the significance of sub-parametric elements in solving the fracture mechanics
problems.

6   (a)   Differentiate between Simpson's rule and Gauss quadrature.
    (b)   Using Gaussian quadrature with $n = 3, 4$ and 5 evaluate $I = \int \int y^2 /x$ over the area of
triangle.

7   (a)   Derive stiffness matrix for axi-symmetric problem by potential energy approach.
    (b)   Derive body force term for axi-symmetric problem.

8   (a)   What are the current trends in finite element analysis software's? Explain the latest
additive modules in ANSYS package.
    (b)   Explain methodology to consider the loads and boundary conditions over the domain
for different types of loads using ANSYS package.

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