

R09

Code No: D2001

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.Tech II - Semester Examinations, March/April 2011

FINITE ELEMENT METHODS
(STRUCTURAL ENGINEERING)

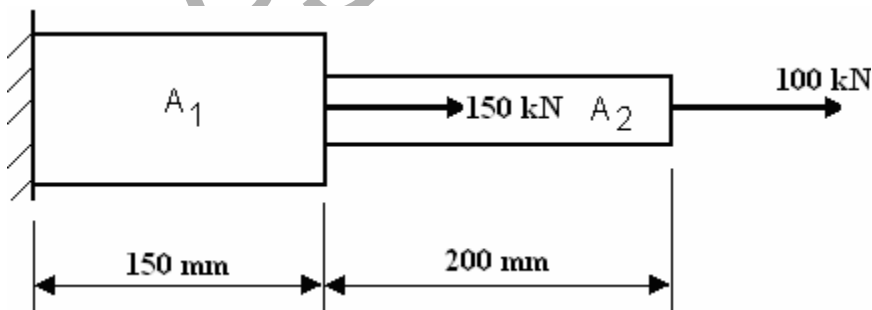
Time: 3hours

Max. Marks: 60

Answer any five questions
All questions carry equal marks

- - -

1. For a simply supported Beam of uniformly distributed load of Intensity P_0 per unit length and a concentrated load P at centre, Find the Transverse deflection using Raleigh-Ritz method of Functional Evaluation and compare the result with exact Analytical solution. [12]
2. a) Write a short notes on plane stress, plane strain and axi-symmetric problems.
b) In a plane stress problem $\sigma_x = 60$ MPa, $\sigma_y = -35$ MPa, $\tau_{xy} = 50$ MPa, $E = 200$ GPa, $\mu = 0.3$.
i) Determine strain component ϵ_z
ii) If the problem is a case of plane strain case determine stress component σ_z . [12]
3. a) Derive the Element Stiffness Matrix for a Truss bar element oriented arbitrarily in a 2-D plane starting from fundamentals.
b) Find the displacements, reaction forces and stresses induced in the axially loaded stepped bar shown in the Figure. Take $E = 2.1 \times 10^5$ N/mm². $A_1 = 50$ mm² $A_2 = 30$ mm². [12]



4. a) The nodal coordinates of the triangular element are 1 (1,1), 2 (4,2), 3 (3,5). At the interior point P, the x coordinate is 3.5 and N_1 is 0.4. Determine N_2 , N_3 and y coordinate at point P.
b) Explain natural and simple natural coordinates. [12]
5. Derive the shape functions for the four noded quadrilateral isoparametric element and indicate the purpose for the computing its stiffness matrix. [12]

Contd....2

::2::

6. a) List some disadvantages of using 3-D elements.
b) Explain the procedure to determine the stiffness matrix of a tetrahedral element. [12]

7. a) Explain Mindlin's approximations for bending of plates.
b) Imagine that each side of a rectangular box is modeled by a mesh of that shell elements. Internal pressure is applied. Along the edges where the sides intersect, What DOF can probably be set to zero, and why? [12]

8. a) State the difference between Material non-linearity and Geometric non-linearity
b) Describe Newton – Raphson iteration technique for solving material non-linearity problems. [12]

FIRSTRANKER