JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech II Semester Examinations, February - 2017
FINITE ELEMENT METHODS
(Structural Engineering)

Time: 3hrs   Max.Marks:75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

5 × 5 Marks = 25

1.a)   State minimum Potential Energy principle.   [5]
  b)   What are the characteristics of Shape functions?   [5]
  c)   What do you understand by serendipity of family of elements? Give examples. [5]
  d)   Briefly write analogy to beams pertaining to several different plate theories. [5]
  e)   What are the applications of non-linear FEA?   [5]

PART – B

5 × 10 Marks = 50

2.   Solve the following differential equation using Rayleigh –Ritz method

$$\frac{d^2\emptyset}{dx^2} - \emptyset = x$$

Use boundary conditions f(x=0) =0 and f(x=1) = 0.   [10]

OR

3.a)   Explain the general procedure for Finite Element Analysis.
  b)   Discuss on comparison of Finite Element and Exact Solution.   [5+5]

4.   Consider the CST element for plane stress and plain strain condition and derive the elemental stiffness matrix.   [10]

OR

5.   Analyse the beam system shown in the figure 1 by using FEM.   [10]
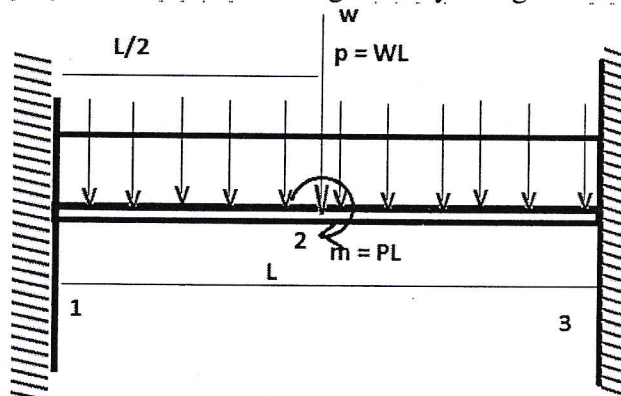

Figure 1

6. Determine the Jacobian matrix for a four-node, two-dimensional quadrilateral element having the parent element whose interpolation functions. [10]

$$N_1(r, s) = \frac{1}{4}(1 - r)(1 - s)$$

$$N_2(r, s) = \frac{1}{4}(1 + r)(1 - s)$$

$$N_3(r, s) = \frac{1}{4}(1 + r)(1 + s)$$

$$N_4(r, s) = \frac{1}{4}(1 - r)(1 + s)$$

OR

7. What are the requisite conditions for a problem in axisysmmetric elements? Discuss with examples. [10]

8. Explain Moment and curvature relations in theory of plates. [10]

OR

9. Explain the behavior of the Shell geometry and shell elements. [10]

10. Determine the eigen values and eigenvectors for the stepped bar shown in the figure 2 below. [10]
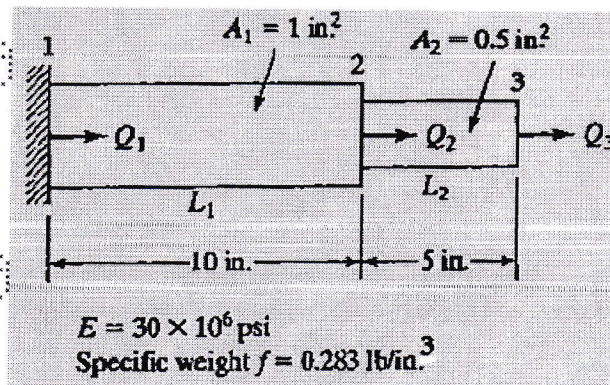

Figure 2

OR

11. What are Eigen value problems? Explain how Eigen values and Eigen vector are evaluated? [10]

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