97

JAYA GROUP OF INSTITUTIONS-THIRUNINRAVUR

6^{th} SEM – B.E. / B.Tech

MODEL - II

INTERNAL ASSESSMENT-1(MODEL EXAM-II)

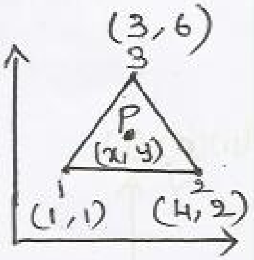
IA - II

Sub. Name: Finite Element Method
Sub. Code: AE 2351
Duration: 180 minutes

Date: 07-03-2015
Branch: Aeronautical
Max.Marks: 100

Part A (10X2=20)

1. Define traction force.
2. Define Shape function.
3. Evaluate the integral using 3 point Gaussian quadrature $\int_{-1}^{1} e^{-x}dx$.
4. Define Super parametric element.
5. State the assumptions made while finding the forces in a truss?.
6. Define Gaussian quadrature.
7. Define Sub parametric element.
8. Write the formula used for strain displacement matrix & stress displacement matrix.
9. Define Iso-parametric element.
10. Determine the x & y coordinates of point P for the triangular element shown in fig. the shape functions N1 & N2 are 0.2 & 0.3 respectively.



Part B (5X16=80)

11.(a). Derive the shape functions of beam and stiffness matrix of a beam element.

(or)

(b). (i) The nodal coordinates of triangular element are shown in fig (1) at the interior point 'P'. The x-coordinate is 3.5 and N1=0.4.Calculate at point 'P'. (4)

(ii) Evaluate the stiffness matrix for the element shown in fig (2). The co-ordinates are shown in units of millimeters. Assume plane stress condition. Let E=2×10^5 N/mm^2, μ=0.25 and t=30mm.

12. (a). Determine the nodal displacement of nodes 1 and 2 and the element stresses for the two dimensional loaded plate as shown in fig.(3). Assume plane stress condition. Take, μ=0.25, E=2×10^5N/mm^2, Thickness=15mm.

(or)

(b). A thin plate is subjected to surface traction as shown in fig. (4). Calculate the global stiffness matrix. Take, t=25mm, E=2×10^5 N/mm^2 and μ=0.30. Assume plane stress condition.

13. (a). The two dimensional propped beam shown in fig (5) is divided into two CST elements. Determine the nodal displacements and element stresses using plane stress conditions. Body forces is neglected in comparison with the external forces. Take, Thickness, t=10 mm; Young's modulus, E=2×10^5 N/mm^2 ; Poisson's ratio, μ =0.25.

(or)

(b).(i). The nodal co-ordinates for an axi-symmetric triangular element are given below: r_1=20mm; r_2=40mm; r_3=30mm; z_1=40mm; z_2=40mm; z_3=60mm. Evaluate [B] matrix for that element. Refer Fig.(6).

(ii). For the element shown in fig.(7). Determine [B] matrix for that element. Take E=200 Gpa and μ =0.25.

14. (a).(i). Evaluate the integral, $I = \int_{-1}^{1}\left[x^2 + \cos\left(\frac{x}{2}\right)\right]dx$ using three point Gaussian quadrature and compare with exact solution.

(ii). Evaluate the integral $\int_{-1}^{1}\frac{\cos x}{1-x^2}\,dx$ by applying 3 point Gaussian quadrature.

(or)

14.(b) A four noded rectangular element is shown in fig 8.determine the following : 1.jacobian matrix ,2.strain displacement matrix ,3.element stresses. Take $E=2X10^5$ N/mm^2; $\mu=0.25$; u=[0, 0, 0.003, 0.004, 0.006, 0.004, 0,0]T; $\varepsilon=0$; $\eta=0$. Assume plane stress condition.

15.(a) For the Iso parametric quadrilateral element shown in fig 9,the Cartesian coordinates of point 'p' are (6,4).the load 10KN &12KNare acting in x &y direction on the point 'p'. evaluate the nodal equivalent forces .

(or)

15.(b) For 4 noded rectangular element shown in fig 10,determine the following 1.jacobian matrix ,2.strain displacement matrix ,3.element stresses. Take $E=2X10^5$N/mm^2; $\mu=0.25$; u=[0, 0, 0.002, 0.003, 0.005, 0.003, 0, 0]T ;$\varepsilon=0$; $\eta=0$. Assume plane stress conditions.

(11)(b) (i)

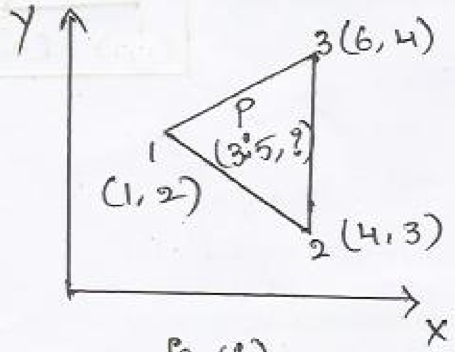


fig (1)

(ii)

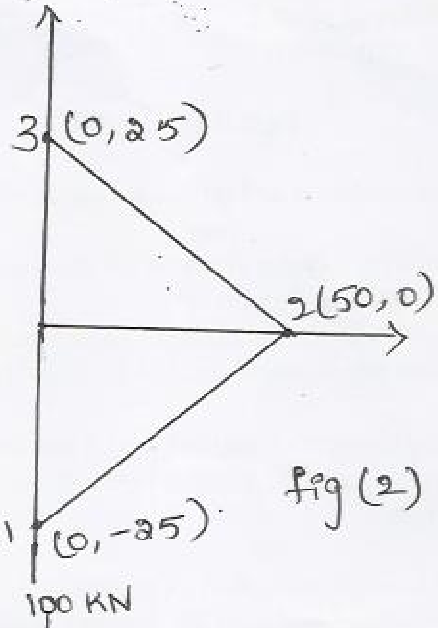


fig (2)

(12) (a)

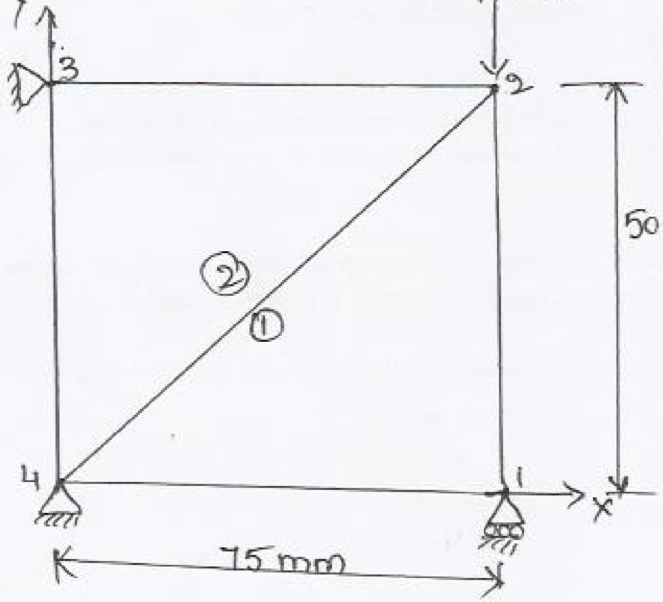


fig (3)

12(b)

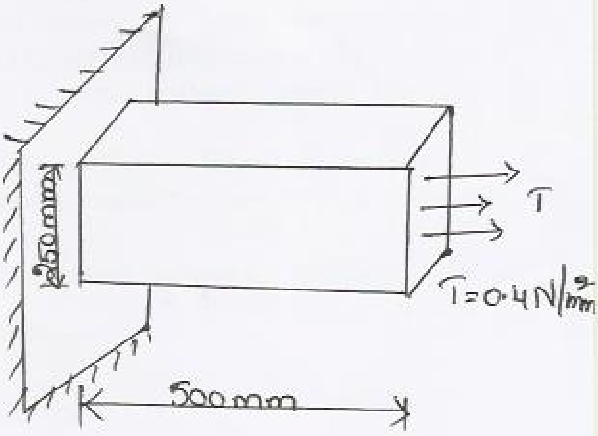


fig (4)

(13) (a)

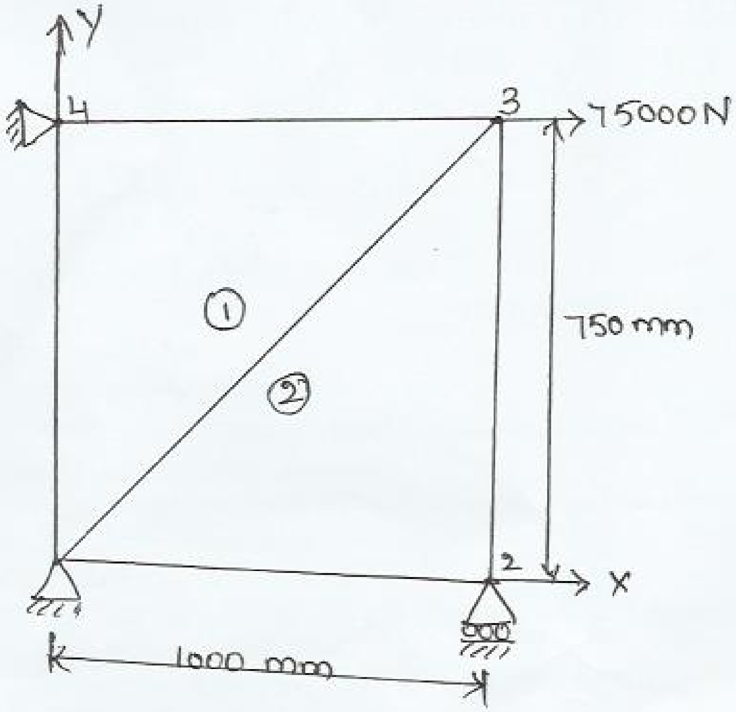


fig (5)

13(b) (i)

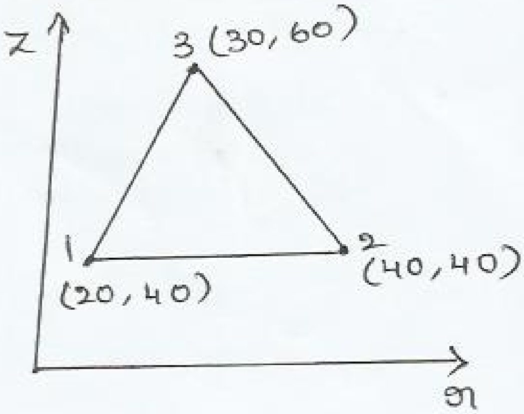


fig (6)

13(b) (ii)

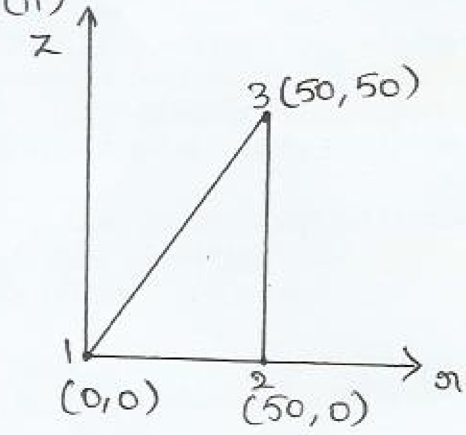


fig (7)

14(b).

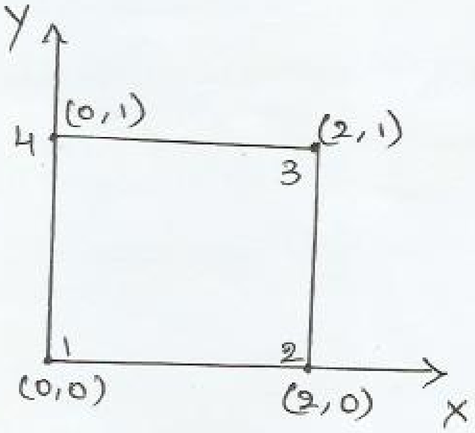


fig (8)

(15) (a)

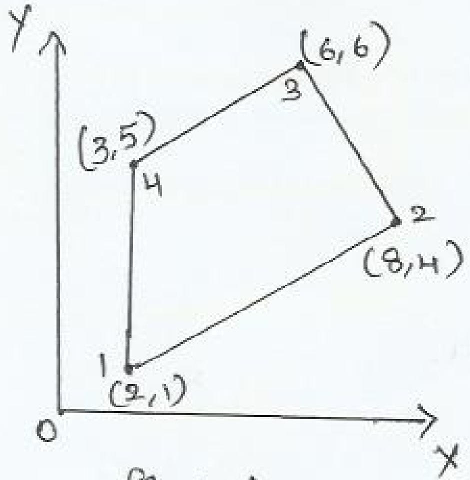


fig (9)

(15)(b)

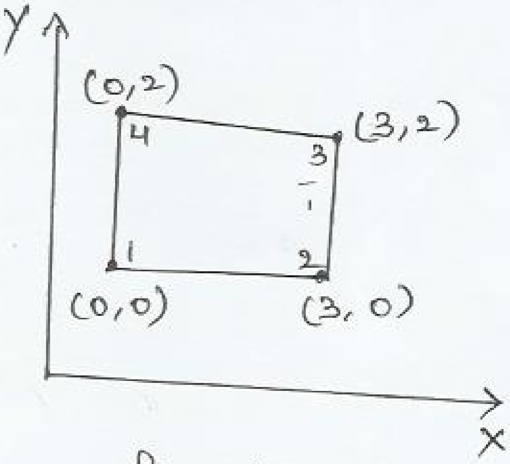


fig (10)