

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
M.Tech. Supplementary, Winter 2017 - 18 Examination

Semester: 2
Subject Code: 03209151
Subject Name: Finite Element Method

Date: 08/01/2018
Time: 02:00 pm to 04:30 pm
Total Marks: 60

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 A) Using Lagrange polynomial, find the shape function for a three noded bar element. Also draw the variation of the shape functions. **(05)**

B) Explain about the pre and post processors of Finite Element Analysis packages. **(05)**

C) Describe the following in short: **(05)**

- i. Primary nodes, secondary nodes and internal nodes
- ii. Effect of element aspect ratio on accuracy

Q.2 Answer the following questions. (Attempt any three) **(15)**

A) Write a short note on Isoparametric equation..

B) Explain in brief:

- i. Plane stress problems
- ii. Plane strain problems

C) What are the convergence requirements of shape functions?

D) Explain "Axi-symmetric" problem? Write constitutive equations for such problems.

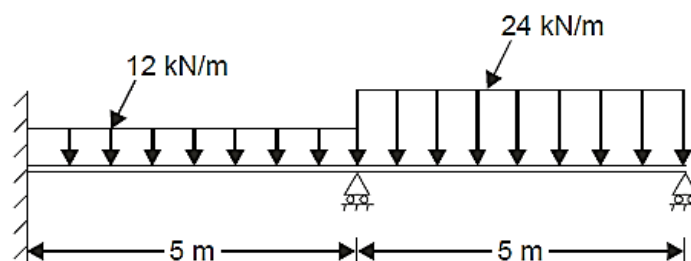
Q.3 A) Derive strain-displacement matrix for Constant-Strain Triangular (CST) element. **(07)**

B) What do you mean by discretization of structures? What are the types of discontinuities in a structure? Explain in brief using neat sketches. **(08)**

OR

B) Explain the concept of plate bending. Also write the Kirchhoff's assumptions involved in plate bending. **(08)**

Q.4 A) Obtain the consistent nodal vector for the loaded beam as shown in the figure given below. Take $E = 2 \times 10^5 \text{ N/mm}^2$ and $I = 5 \times 10^6 \text{ mm}^4$. **(07)**



OR

- A) State the applications of Finite Element Method. List the advantages and disadvantages of Finite Element Method over Finite Difference Method. **(07)**
- B) Evaluate the matrices necessary to determine the stiffness matrix for the tetrahedral element with the four nodes are (0,0,0), (1,1,2) , (0,2,0) and (2,1,0). Take the value of $E=30 \times 10^6$ kN/mm² and $\mu=0.30$. **(08)**