Seat No: _____ **Enrollment No:** _____

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

M.Tech., Winter 2018 - 19 Examination

Semester: 2 **Date: 10-12-2018**
Subject Code: 03209151 **Time: 02:00 pm to 04:30 pm**
Subject Name: Finite Element Method **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)** Define Strain-Displacement and Stress-strain Relationships for a Constant-Strain Triangular Element. **(05)**

B) Write a short note on Comparison of CST and LST. **(05)**

C) Explain Isoparametric Shape function for the Bar element. **(05)**

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

A) Describe the general steps of Finite Element Method.

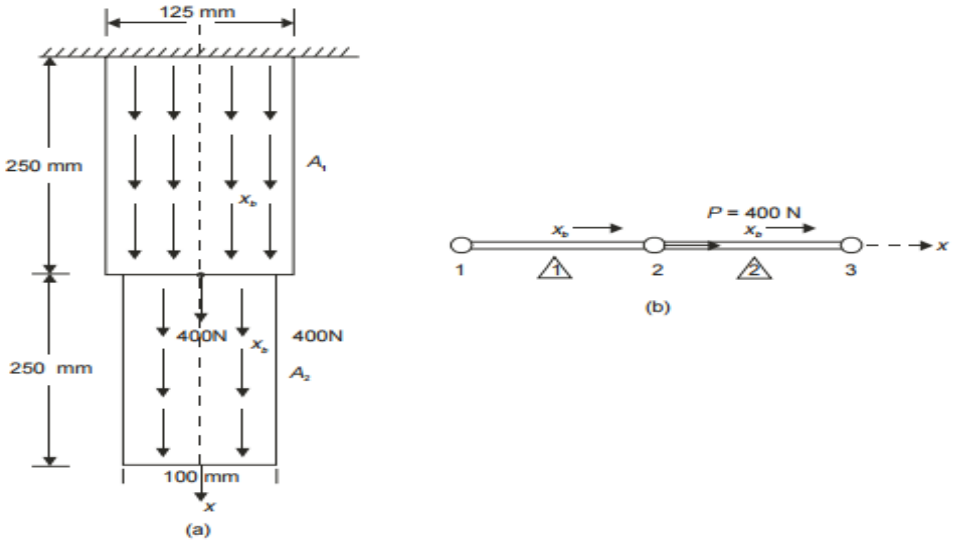
B) Explain the term 'Axi-symmetric problems' and give constitutive law for such problems.

C) How can you differentiate between Finite Element Method and Classical Methods?

D) Enlist Computer Programs for the Finite Element Method and also write their capabilities.

Q.3 **A)** Evaluate the matrices necessary to determine the stiffness matrix for the tetrahedral element having four nodes (0,0,0), (1,1,2) , (0,2,0) and (2,1,0). Take $E=30\times10^6$ kN/mm^2, $\mu=0.30$. **(07)**

B) The thin plate of uniform thickness 20 mm is as shown in figure below. In addition to the self weight, the plate is subjected to a point load of 400N at mid-depth. The Young's modulus $E = 2 \times 10^5$ N/mm^2 and unit $\rho = 0.8 \times 10^{-4}$ N/mm^3. Analyse the plate after modeling it with two elements and find the stresses in each element. **(08)**



OR

B) Explain Plate bending element along with Kirchhoff"s assumptions. **(08)**

Q.4 **A)** Derive Stiffness matrix for a Tetrahedral solid element. **(07)**

OR

A) Using generalized coordinate approach, find shape functions for two noded bar/truss element **(07)**

B) Explain plane stress and plane strain condition with stress/strain matrices. **(08)**