M. Tech. Civil Engg. (Structural Engineering & Construction) CBCS Pattern Semester-II
PSES21 - Finite Element Method

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Notes : 1. All questions carry equal marks.
2. Due credit will be given to neatness and adequate dimensions.
3. Illustrate your answers wherever necessary with the help of neat sketches.
4. Solve **any five** questions.

1. a) Explain the concept of discretization in finite element method. **7**

b) Explain the Rayleigh Ritz method for analysis of beam. **7**

2. Drive an expression for shape function and assembly the stiffness matrix for bending in beam elements. **14**

3. Determine the element stresses for the triangular element shown in figure 1. The nodal displacements are given as $u_1 = 0.005\,\text{mm}, u_2 = 0.002\,\text{mm}, u_3 = 0.0\,\text{mm}, u_4 = 0.0\,\text{mm},$ $u_5 = 0.004\,\text{mm},$ and $u_6 = 0.0\,\text{mm}$. Take E = 200 GPa & v = 0.3. Use unit thickness for plane strain. **14**
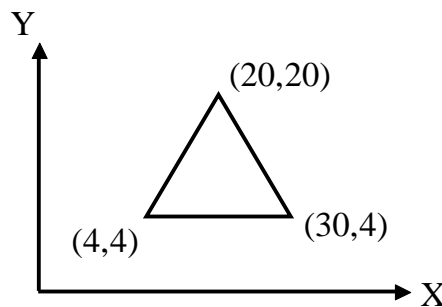

Figure 1

4. Derive the element stiffness matrix and strain displacement matrix for a 4 – noded isoperimetric quadrilateral element. **14**

5. a) Explain the classical plate bending theory. **7**

b) Explain the Mindlin plate bending theory. **7**

6. Explain various modeling techniques, storages and solution techniques in finite element method. **14**

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