JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B. Tech III Year II Semester Examinations, May/June, 2013
Finite Element Methods
(Common to ME, AE)

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- - -

1.a) Differentiate between planar frame element and space frame element.

b) Use finite element method to calculate displacements and stresses of the bar shown in the Figure.1. [15]
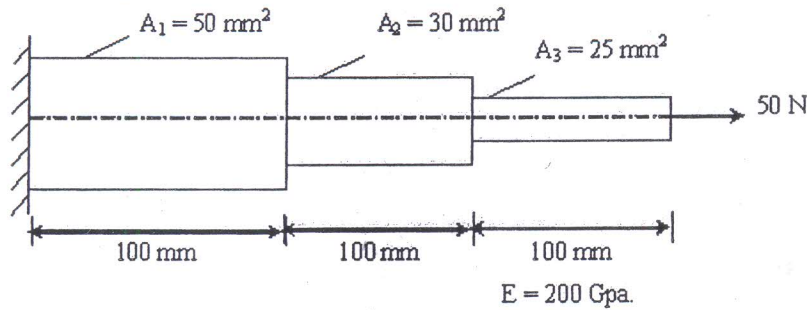

Figure.1

2.a) Write about different boundary considerations in beams.

b) For a beam and loading shown in Figure.2, determine the slopes at 2 and 3 and the vertical deflection at the midpoint of the distributed load. [15]
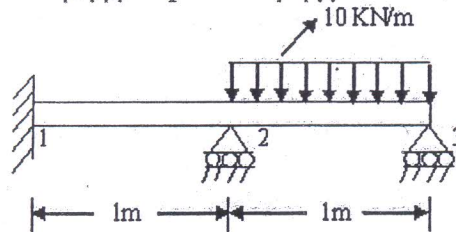

Figure.2

3. Determine the deflection at the free end under its own weight using three elements shown in figure.3, $E = 200Gpa$ and $\rho = 7800\ kg/m^3$. [15]
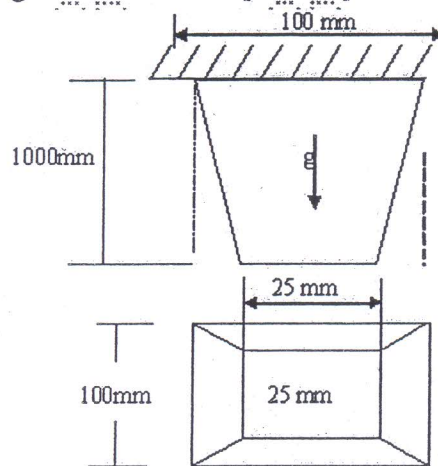

Figure.3

4. Calculate the nodal displacement, stresses and support reactions for the truss shown in Figure.4. [15]
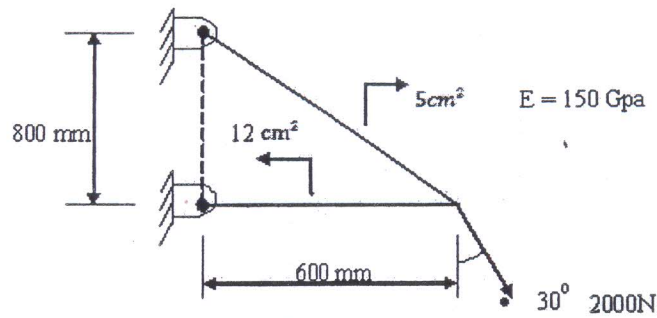

Figure.4

5.a) An axisymmetric triangular element is subjected to the loading as shown in Figure.5. the load is distributed throughout the circumference and normal to the boundary. Derive all the necessary equations and derive the nodal point loads.
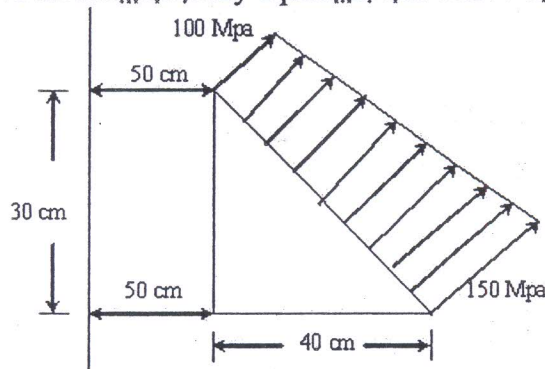

Figure.5

b) Discuss in detail about Hexahedron element and their higher order element. Derive the [B] matrix for any one type of Hexahedron element. [15]

6.a) Write the steps involved with finite-element analysis of a typical problem.

b) Determine the nodal displacements, element stresses and support reactives for the bar as shown in Figure.6. Take $E = 200 \times 10^9 \text{ N/m}^2$. [15]
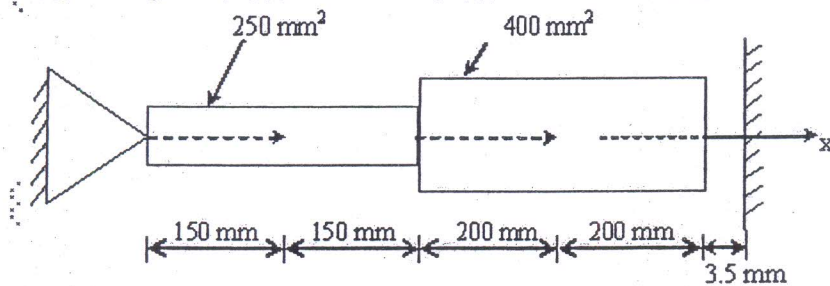

Figure.6

7.a) Distinguish between consistent mass matrix and Lumped mass matrix.

b) Consider axial vibration of the steel bar shown in Figure.7.
i) develop the global stiffness and mass matrices and
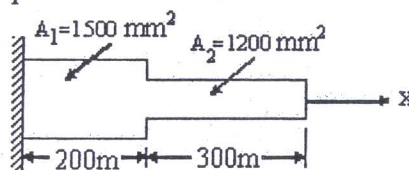ii) determine the natural frequencies and mode shapes using the characteristic polynomial technique. [15]

Figure.7