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### M. TECH. DEGREE EXAMINATION, MODEL QUESTION PAPER – I

**First Semester**

### Branch: Mechanical Engineering

Specialisation: Computer Integrated Manufacturing / Advanced Manufacturing and Production Management

**MMECM 104 /MMEMP 105-3 FINITE ELEMENT METHOD**

(Regular – 2013 Admissions)

Time: Three Hours (Answer all Questions) Maximum:100 Marks

1. (a) With a suitable example explain the general procedure for obtaining solution of a continuum problem using finite element method. (15 marks)

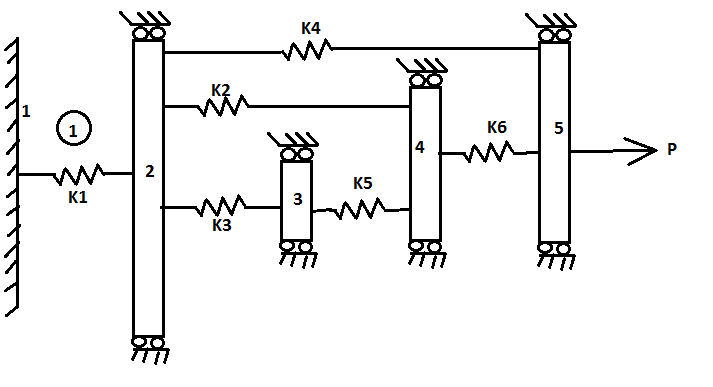
(b) Write a brief note on the history of FEM (10 marks)

**OR**

1. (a) Make a comparison between FDM and FEM (10 marks)

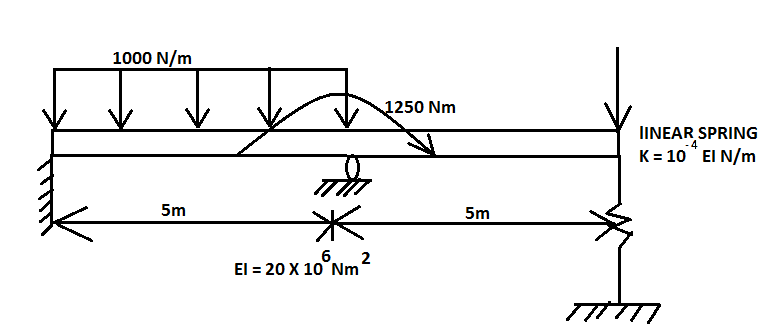
(b) Explain the various types of elements used in FEM (15 marks)

1. For the assembly given below find the element stifness matrix and the global stifness matrix ,nodal displacements and force in each element. Assume K1 =1000N/mm, k2 = 2k1, K3 = 3K1, K4 = 4K1, K5=5, K1K6 =6K1 , P = 10000N (25 marks)



**OR**

1. For the beam loaded as shown , determine (a) the global stifness natrix, (b) the vertical displacement at the right end,(c) the nodal rotations, (d)nodal reactions, (e) forces in shear elements (25 marks)



1. Consider the different equation + 600 = 0 ; 0 ≤ x ≤ 1 with the boundary conditions Find the solution to problem using galerkin method and trial solution is rotating at constant angular velocity 32rad/s. determine the axial stress distribution in the rod using 2 quadratic elemnts. Consider only the centrifugal force,ignore the bending of the rod. Assume A= 100mm2 , E= 210 Gpa, density = 7800Kg/m3 (25 marks)



**OR**

1. (a) Derive the mass metrix for a CST element (10 marks)

(b) With suitable example, explain any to weighted residual methods (15 marks)

1. (a) Derive the mass matrix for an axisymmetric triangular element. (10 marks)

(b) Two steel plates of size 100mm X 50mm X 3mm are but welded. Explain the steps involved in analyzing the temperature distribution in the plate using finite element package (15 marks)

**OR**

1. (a) Explain the terms (a) Mesh generation (b) Node number generation. (c) Element assembly. (d) Post processing (10 marks)

(b) Temperature distribution during orthogonal turning is to be analyzed using a finite element package. Explain the steps involved. (15 marks)