C 14744 (Pages : 2) Name.....

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2010

ME 04 604—FINITE ELEMENT METHOD

Time : Three Hours Maximum : 100 Marks

Answer all the questions.
Any missing data may be suitably assumed.

I. (a) Explain the properties of stiffness matrix.

(b) Mention different sources of errors in FEA.

(c) Explain the band width of the stiffness matrix.

(d) What is a natural co-ordinate system?

(e) Explain strain disp relation in an element.

(f) Briefly explain how element matrices are assembled with the help of few triangular elements.

(g) Explain advantages of isoparametric elements with suitable examples.

(h) Briefly describe Rayleigh-Ritz method.

(8 × 5 = 40 marks)

II. (a) What are various applications of Finite Element Analysis? Explain with simple examples.

(b) Derive the generalised stiffhess matrix from minimum potential energy principle.

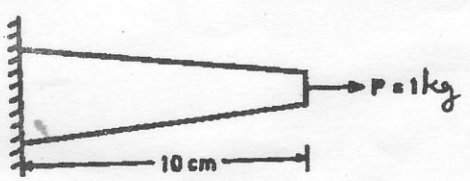
Or

(c) Explain the physical interpretation of finite element method for one dimensional analysis with a suitable example.

III. (a) Derive the element stiffness matrix for the 2-noded beam element using direct approach.

Or

(b) Find the stress distribution in the tapered bar shown in Figure. below using two finite elements under an axial load of P = 1 kg



Cross sectional area at root = 2 cm^2

Cross sectional area at end = 1 cm^2

Young's modulus = 2×10^6 kg/cm^2

Turn over

IV. (a) On a four nodal quadrilateral plane stress element the nodes are (0, 0), (6, 2), (6,6) and (1,5). A concentrated load whose x and y components are 10 kN, respectively is applied at a point (4, 5). Find the equivalent nodal forces and the displacement of nodes.

Or

(b) A composite slab consists of three materials of different thermal conductivitie i.e 20 W/m K, 30 W/m-°K, 50 W/m-°K of thickness 0.3 m, 0.15 m, 0.15 m respectively. The outer surface is 20°C and the inner surface is exposed to the convective heat transfer coefficient of 25W/m^2-K at 300°C. Determine the temperature distribution within the wall?

V. (a) Using Area Co-ordinates, develop shape functions for a six Node Triangular element.

Or

(b) Derive the shape functions of a constant strain triangular element. Also briefly explain area co-ordinates.

(4 × 15 = 60 marks)