8. (a) Discuss the use of triangular plate bending elements. 10

(b) Explain briefly the various factors to be considered in the development of curved shell elements. 10

Roll No. .....

24519

B. Tech. 7th Semester (Civil Engg.) Examination – December, 2016

FINITE ELEMENT METHODS

Paper : CE-417-F

Time : Three Hours] *[Maximum Marks : 100*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt any *five* questions. All questions carry equal marks.

1. (a) Explain the term 'Shape Functions'. Why polynomial terms are preferred for shape functions in finite element method ? 10

(b) Discuss the advantage and disadvantages of FEM over : 10

(i) Classical method

(ii) Finite difference method

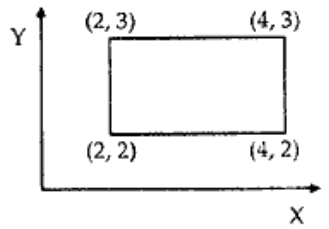
2. Using Lagrange polynomial, find the shape functions for three noded and five noded bar elements. 20

3. Determine using any weighted residual techniques the temperature distribution along a circular fin of length of 6 cm and radius 1 cm. The fin is attached to a boiler whose wall temperature is 140°C and the free end is insulated. Assume convection coefficient h = 10 W/cm^2 °C. Conduction coefficient K = 70 W/cm^2 °C and T_∞ = 40 °C. The governing equation for the heat transfer through the fin is given by 20

$$-\frac{d}{dx}\left[KA(x)\frac{dT}{dx}\right] + hp(x)(T - T_\infty) = 0$$

Assume appropriate boundary conditions and calculate the temperature at every 1 cm from left end.

4. A bilateral rectangular element has coordinates as shown in figure and the nodal temperatures are T_1 = 100 °C, T_2 = 60 °C, T_3 = 50 °C, T_4 = 90 °C. Compute the temperature at the point whose coordinates are (2.5, 2.5). Also determine the 80 °C isotherm : 20



5. Write short notes on : 20

(i) Galerkin's method

(ii) Variation Method

(iii) Hermite Polynomials

6. (a) Explain the isoparameteric concept in finite element analysis. 10

(b) Explain the terms isoparameteric, subparameteric and superparameteric elements. 10

7. A beam of length 10 m, fixed at one end and supported by a roller at the other end carries a 20 kN concentrated load at the centre of the span. By taking the modulus of elasticity of material as 200 GPa and moment of inertia as 24×10^{-6} m^4, determine : 20

(i) Deflection under load

(ii) Shear force and bending moment at mid span

(iii) Reaction at supports