Roll No. ....

24519

B. Tech 7th Sem. (Civil Engineering)

Examination – June, 2016

FINITE ELEMENT METHODS

Paper : CE-417-F

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

Before answering the question, 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 concept of FEM briefly and outline the procedure.   **10**

   (b) Define Shape function. Derive the expression for shape function of a constant strain triangular element.   **10**

2. Describe the Rayleigh Ritz method and Galerkin's method with suitable example.   **20**
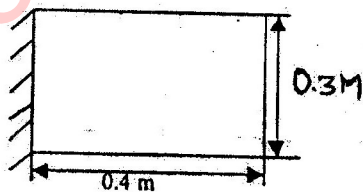
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3. (a) Determine the shape function-for a three noded bar element using lagrangian functions. Define characteristics of sound and its. measurements. 10

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

(i) Classical method

(ii) Finite difference method

4. Determine the nodal displacement, stress and strain for the bar shown in Figure. The area of cross section of lower portion is twice of the upper portion. The elastic modulus of the bar is E. 20
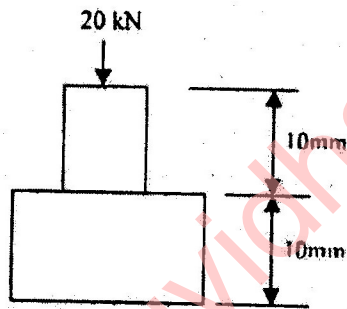
5. Compute the steady state temperature distributions in the plate shown in figure below by discretizing the domain of interest using triangular elements. Assume; $T_\alpha = 25°C$, h = 50W/m² °C, k =1.5 W/m °C. 20
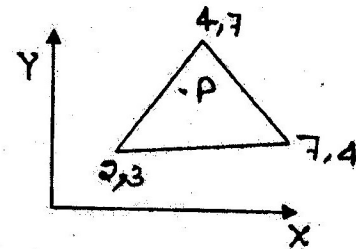

6. Determine the temperature distribution along a circular fin of length 5 cm and radius 1 cm. The fin is attached to a boiler whose wall temperature 140°C and the free end is open to the atmosphere. Assume T_α = 40°C, h = 10W /cm² °C, k =70W/cm. °C. 20

7. Determine the Eigen values and natural frequencies of a system whose stiffness and mass matrices are given by : 20

$$[K] = \frac{2AE}{L}\begin{bmatrix} 3 & -1 \\ -1 & 1 \end{bmatrix}, M = \frac{QAE}{12}\begin{bmatrix} 6 & 1 \\ 1 & 2 \end{bmatrix}$$

8. Determine the shape functions N_1, N_2, N_3 at the interior point P(3.5, 5) for the triangular element shown in figure. 20