USN

12MTP12/13MTH12

First Semester M.Tech. Degree Examination, Dec. 2013/Jan. 2014
Finite Element Method

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. State the law of conservations of mass, momentous and energy. **(06 Marks)**
b. Write the steps involved in discrete system. **(06 Marks)**
c. Explain steps involved in solving a problem by FEM. **(08 Marks)**

2 a. Obtain the shape functions for one dimensional linear element in global co-ordinate system. **(10 Marks)**
b. Obtain the shape function for one dimensional quadratic elements in natural co-ordinate system. **(10 Marks)**

3 a. Explain iso, sub and super parametric elements. **(08 Marks)**
b. Obtain the shape functions for linear quadrilateral elements using Lagrange formula. **(12 Marks)**

4 a. Solve the governing equation $\frac{d^2\theta}{d\xi^2} - \mu^2\theta = 0$ by Rayliegh – Ritz method. **(10 Marks)**
b. List the properties of shape functions. **(06 Marks)**
c. Explain penalty formulation. **(04 Marks)**

5 A composite wall consists of three materials, as show in Fig. Q5. The outer temperature is T_0 = 20°C. Connection heat transfer takes place on the inner surface of he wall with T_∞ = 800°C and h = 25 w/m^2°C. Determine the temperature distribution in the wall. **(20 Marks)**

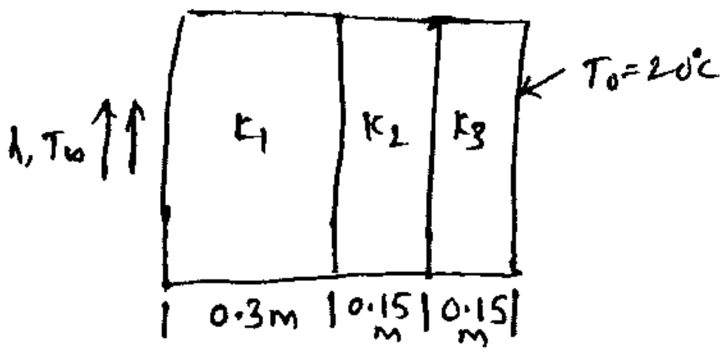

Fig. Q5

6 a. Explain the application of Galerkin method for transient equation subjected to appropriate boundary and initial conditions. **(12 Marks)**
b. Explain phase change problem. **(08 Marks)**

7 An axial load $P = 300 \times 10^3 N$ is applied at 20°C to the rod as shown in figure. The temperature is then revised to 60°C. Determine the nodal displacements and elements stresses.

$E_1 = 70 \times 10^9\ N/m^2$	$E_2 = 200 \times 10^9\ N/m^2$
$A_1 = 900\ mm^2$	$A_2 = 1200\ mm^2$
$\alpha_1 = 23 \times 10^{-6}$ per °C	$\alpha_2 = 11.7 \times 10^{-6}$ per °C

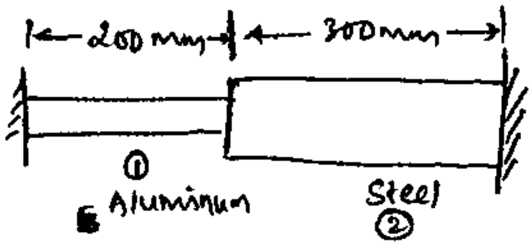

Fig. Q7

(20 Marks)

8 Write short notes on :

a. Upwind finite element method
b. Diffusion problems
c, Split scheme
d, Mesh convergence. **(20 Marks)**

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