CBCS Scheme

USN | | | | | | | | | | |

16/17MDE12

First Semester M.Tech. Degree Examination, June/July 2018
Finite Element Method

Time: 3 hrs. Max. Marks: 80

Note: ***Answer FIVE full questions, choosing ONE full question from each module.***

Module-1

1 What are the basic steps involved in finite element method to solve mechanical engineering problems and explain briefly with an example. **(16 Marks)**

OR

2 The potential energy for the linear one dimensional rod as shown in Fig.Q2 with body force neglected is $\pi = \frac{1}{2}\int_0^2 EA\left(\frac{du}{dx}\right)^2 dx - 2u$ where $u_1 = u(x = 1)$. Solve it by Galerkin's approach. **(16 Marks)**

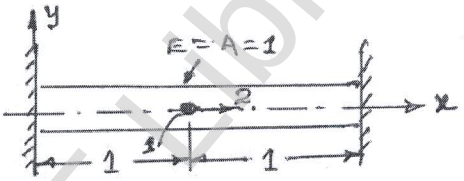

Fig.Q2

Module-2

3 a. What are the properties of stiffness matrix. **(03 Marks)**

b. A stepped bar as shown in Fig.Q3(b). Using Penalty approach for handling boundary conditions. Determine :
i) Nodal displacements ii) Stress in each material iii) Reaction forces. **(13 Marks)**

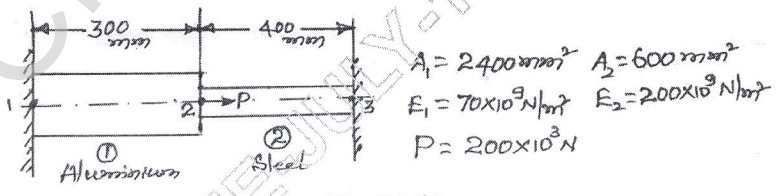

Fig.Q3(b)

OR

4 Derive a stiffness matrix for a beam element by using shape function. **(16 Marks)**

Module-3

5 What are shape function and derive the element stiffness matrix for a four noaded quadrilateral membrane element (QUAD4). **(16 Marks)**

OR

6 a. Write a note on hexahedral elements and explain its properties. **(08 Marks)**

b. What is sendipity finite element method and explain its geometric composition. **(08 Marks)**

Module-4

7 Obtain the equations of equilibrium of plate theory for an isotropicmaterial subjected to twisting moment per unit length. **(16 Marks)**

OR

8 Name the properties and degrees of freedom for the following elements :
i) Flat element ii) Curved element iii) Cylindrical element iv) Conical shell element. **(16 Marks)**

Module-5

9 For the pin jointed truss element shown in Fig.Q9 prove that fundamental frequency is given by $W = \frac{0.648}{L}\sqrt{F/\rho}$. **(16 Marks)**

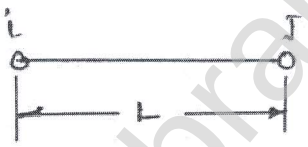

Fig.Q9

OR

10 Find the eigen value and eigen vectors for the beam shown in Fig.Q10 and find buckling load. **(16 Marks)**

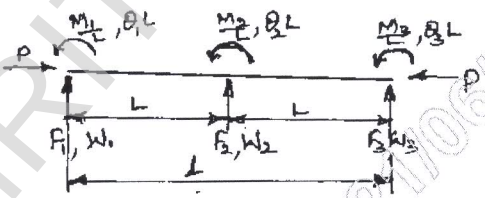

Fig.Q10

* * * * *