Printed Pages: 4 **EME-061/EPL061**

(Following Paper ID and Roll No. to be filled in your Answer Books)	
Paper ID : 187857	**Roll No.**

B.TECH.

Theory Examination (Semester-VIII) 2015-16

FINITE, ELEMENT METHOD

Time : 3 Hours ***Max. Marks : 100***

Attempt questions from all sections as per instructions.

Section-A

1. Attempt all parts. Each part carries two marks (2×10=20)

(a) Write down the advantage of FEM for engineering analysis problem.

(b) Discuss different type of element used in FEM.

(c) What are types of the error in FEM solution?

(d) Write down the formula for stiffness matrix of one dimensional truss element.

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(e) Differentiate between finite element and finite difference method citing a real field problem.

(f) Write the formula for force matrix in one dimension.

(g) Define the connectivity matrix.

(h) What is the shape function?

(i) Write down the types of force study in FEM.

(j) Define the global matrix.

Section-B

2. Attempt any five parts. Each part carries 10 marks. (10×5=20)

(a) Using Rayleigh-Ritz method, compute the axial displacement 'u' and axial stress '?x' for an uniform cross section bar loaded with an uniformly distributed axial load variation as q = cx along length, where 'c' is load per unit cross section.

(b) Give example of 2nd order :

(i) Boundary value

(ii) Initial value

(iii) Eigen value problem.

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(c) Discuss the errors involved in finite element solution with the example of a model second order differential equation in one dimension.

(d) Elements of coefficient matrix of a certain finite element model is given by the following integral :

$$I = \int_0^1 F(x)\,dx, \text{ , where } F(x) = (1 + x)-1.$$

Evaluate the integral using Gauss-Legendre three point formulas and determine error in this.

(e) A composite plane wall consist of three materials with conduction and convective coefficient given as (k1, k2, k3) and (h1, h2, h3) with cross sectional area 'A' each. Find the effective resistance with an analogy to thermal circuit. Develop global matrix for temperature change from 400°C to 100°C from one side of wall to other side.

(f) State Kirchoff's theory and Mindlin theory for plate bending problem. Using four corner nodes plate, explain displacement, rotation, strain force and moments for both.

(g) For a simply supported beam of span length 'l' and with a load of 30 KN applied at the mid span, develop the global matrix using two elements.

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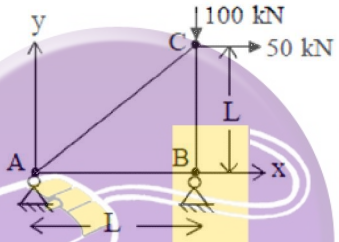
Section-C

Attempt any two parts. Each part carries 15 marks. (15×2=20)

3. The three member truss shown in figure-1 have identical cross-section 'A' an elastic modulus 'E'. Derive the global finite element matrix and evaluate the horizontal and vertical displacement at the joint 'C' and the reactive forces at joint 'A' and 'B' at hinged support.



(Figure-1)

11. Example a real field solid mechanics problem, where quarter symmetric analysis is possible, Draw computer flow chart and write in brief a FORTRAN program to evaluate global matrix.

12. For a square, isotropic elastic body of thickness 'h', the displacement are approximated by :

$U(x, y) = (1 - x)\, yu_1 + x(1 - y)u_2$

$V(x, y) = 0.$

Assuming plane stress condition, derive the stiffness matrix for the unit dimensioned square.

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