Roll No…….. **Total No. of Printed Pages: [01]**
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B.Sc. (Hons. Math) (Semester – 5th)
FINITE ELEMENT METHODS
Subject Code: BMAT1-517
Paper ID: [18131224]

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:
   a. Define the approximate methods
   b. What is the Method of least Squares?
   c. What is the Method of Weighted Residuals?
   d. What is the Hooke's Law?
   e. What are the homogeneous Dirichlet boundary conditions?
   f. What is the eigen value problem (EVP)?
   g. What is the boundary value problem (BVP)?
   h. What is Mechanics of solids?
   i. What is the Strain?
   j. What is the parabolic partial differential equation?

Section – B **(5 marks each)**

Q2. What are the applications of Finite Element Method (FEM)?

Q3. What is the Rayleigh-Ritz Method for solving the boundary value problem?

Q4. Solve the boundary value problem $y'' - y = x^2$ by using the Galerkin's Method with boundary conditions y(x = 0) = 0 and $y(x = 1) = 0$.

Q5. Derive the Stiffness Matrix for a single spring (Element)

Q6. Define the different types of Stresses

Section – C **(10 marks each)**

Q7. Solve the differential equation $y'' + y' - 2y = 0,$ by using the Point Collocation Method with boundary conditions y(x = 0) = 0 and y(x = 1) =1.

Q8. Evaluate $I = \int_0^L N_i \, N_j \, dx.$

Q9. Derive the Stiffness Matrix of an axisymmetric element using the potential approach