Printed Pages: 02 **Sub Code:KME-053**

Paper Id: | 2 | 3 | 1 | 2 | 4 | 5 | **Roll No.** | | | | | | | | | | | | |

B.Tech.
(SEM V) THEORY EXAMINATION 2022-23
FINITE ELEMENT METHODS

Time: 3 Hours ***Total Marks: 100***

Note: Attempt all Sections. If you require any missing data, then choose suitably.

SECTION A

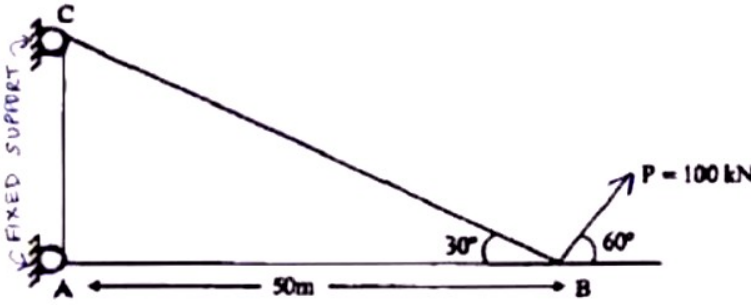
1. Attempt *all* questions in brief. **2x10 = 20**

(a) Explain the merits and demerits of finite element methods
(b) Describe steps involved in finite element analysis
(c) Discuss the steps in Raleigh Ritz method
(d) State the principle of minimum potential energy
(e) Explain the features of hermite polynomial with an example
(f) Discuss natural coordinate system in one dimension
(g) Explain Galerkin Approach and how it is used in FEM
(h) Define Stiffness matrix
(i) State the significance of boundary conditions
(j) Discuss the practical consideration in finite element applications

SECTION B

2. Attempt any *three* of the following: **10x3 = 30**

(a) Differentiate between Finite element method and classical method if solving problem. Also describe the principle of finite element method.
(b) Using Rayleigh Ritz method or weighted residual method Find out the expression for deflection of a cantilever beam of length 'L' subjected to a uniformly distributed load over its entire length. Consider E = modulus of elasticity and I = Area moment of Inertia.
(c) Explain Lagrange and hermite polynomial with the help of an example
(d) Develop the stiffness matrix and determine nodal displacement for given truss shown in Fig. Also find stresses in bar AB and BC.



Take cross section area for members as $0.2m^2$, E= 220GPa

(e) Describe the characteristics of four node quadrilateral element

SECTION C

3. Attempt any *one* part of the following: 10x1 = 10

(a) Describe pre-processing and post processing in finite element analysis and explain their advantages

(b) Explain exact and approximate solution and discuss the applications of finite element method.

4. Attempt any *one* part of the following: 10 x1 = 10

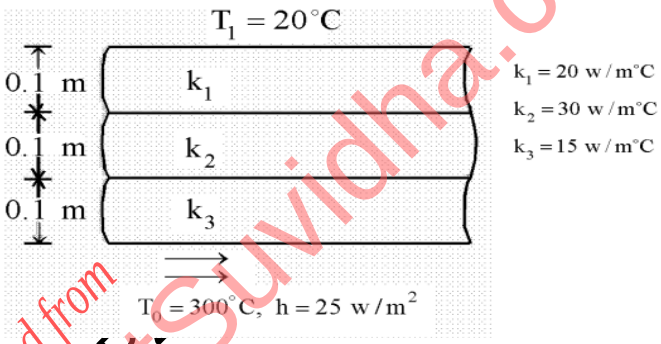
(a) Explain the variational approach of finite element method. What are its limitations?

(b) Derive the stress-strain relationship and strain displacement relation

5. Attempt any *one* part of the following: 10x1 = 10

(a) Discuss the application of finite element method to elasticity problems and explain the concept of shape function

(b) A composite wall consists of three walls as shown in the figure. The inner temperature is T = 20ºC and convective heat transfer takes place on the outer wall, T_0 = 300ºC . Determine the temperature distribution in the wall.



6. Attempt any *one* part of the following: 10x1 = 10

(a) Explain and differentiate between local and global coordinate system in finite element method

(b) Describe the lagrangian shape function with an example.

7. Attempt any *one* part of the following: 10x1 = 10

(a) Explain the characteristics of triangular element. Also explain problem modelling

(b) Explain in detail the problem solving on different FEM software packages such as ABAQUS and NISA