

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2025

M.Tech-1st Semester (CE)

COURSE CODE (CREDITS): 25M1WCE114 (3)

MAX. MARKS: 25

COURSE NAME: FINITE ELEMENT METHOD

COURSE INSTRUCTORS: DR SAURAV

MAX. TIME: 1 Hour 30 Min

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

(c) Use of Non Programmable Scientific Calculator is allowed

Q.No	Questions	CO	Marks
Q1	Derive and analyze the relationship between the natural coordinate (ξ) and Cartesian coordinate (x) for a two-noded bar element. <i>Illustrate and compare</i> the graphical variation of the shape function expressed in terms of ξ , L_1 , and L_2 .	3	5
Q2	Formulate the shape functions for a Constant Strain Triangle (CST) element using a polynomial function approach. Show all intermediate steps clearly.	3	5
Q3	Develop the general equation to obtain the shape function of a two-noded bar element in terms of the natural coordinate (ξ). Explain each step involved in the derivation.	3	5
Q4.	Explain the strain–displacement matrix approach for a bar element, and <i>derive</i> the corresponding strain–displacement matrix $[B]$ for a bar element of length L . Interpret the physical significance of each term in $[B]$.	3	5
Q5.	A one-dimensional two-noded element has end coordinates $x_1 = 0$ mm and $x_2 = 200$ mm. Calculate the natural coordinates (L_1 and L_2) for a point located at $x = 75$ mm, and verify that $L_1 + L_2 = 1$.	3	5