Code No: 138CC

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year II Semester Examinations, September - 2020
FINITE ELEMENT METHODS FOR CIVIL ENGINEERING
(Civil Engineering)

Time: 2 Hours **Max. Marks: 75**

Answer any Five Questions
All Questions Carry Equal Marks
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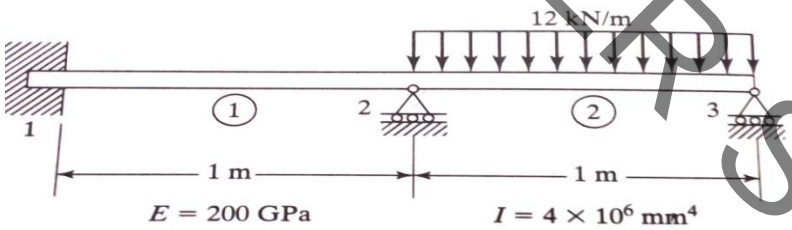
1.a) Explain the steps involved in obtaining an approximate solution using finite element Method.
b) Assemble the global stiffness matrix and load vector for a bar element. [7+8]

2.a) Develop area coordinates using natural coordinate system.
b) What are the "Convergence requirements" to be fulfilled in an assumed displacement function of an element? Discuss them in detail. [7+8]

3.a) What do you mean by shape functions and derive shape functions for a simple bar element?
b) Derive the shape functions of a simple rectangular Lagrangian element in terms of isoparametric element form. [7+8]

4.a) Derive stiffness matrix of a simple bar element using interpolation functions.
b) Derive Hermite Shape function for the beam element. [7+8]

5.a) Determine the Slopes at Nodes 2, 3 and the vertical deflection at the midpoint of the distributed load for the loaded beam shown in figure.



b) Derive the methodology to develop a stiffness matrix and load vector for a 2-noded beam element with 4 degrees of freedom. [7+8]

6.a) For a cantilever beam of length 'L' subjected to free end load P. Determine the maximum deflection and reactions using FEM. Let 'EI' be the constant value throughout the beam.
b) Using the general approach of displacement function, derive the force-displacement relationship and element stiffness matrix. for a truss bar element. [7+8]

7.a) Derive shape functions of a simple rectangular element in terms of iso-parametric element
b) Differentiate between CST and LST with respect to the triangular element. [8+7]

8.a) Explain the static condensation of stiffness matrix with an example.
b) Evaluate $\int_1^3 \frac{dx}{x}$ using numerical integration technique. Check the solution with exact answer. [7+8]

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