Code No: **R1641033** **R16** **Set No. 1**

IV B.Tech I Semester Supplementary Examinations, July/Aug - 2021

FINITE ELEMENT METHODS

(Common to Mechanical Engineering and Automobile Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any FOUR questions from Part-B
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PART–A *(14 Marks)*

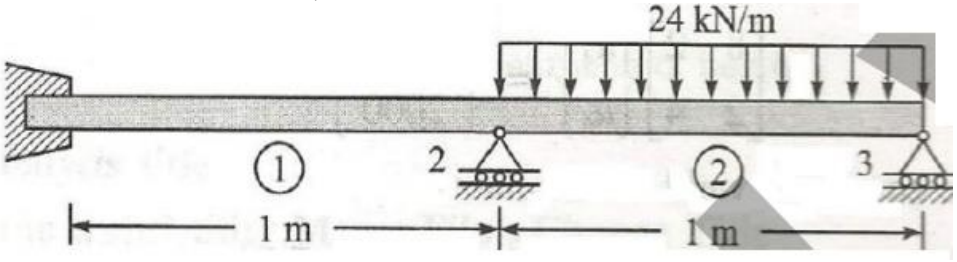
1. a) Define Weighted- Residual method. [2]
   b) What is meant by discretization? [3]
   c) Write the hermite shape functions of a two node beam element. [3]
   d) What is axisymmetric analysis? [2]
   e) What are higher order elements? Give examples. [2]
   f) What is consistent mass matrix? Write the consistent mass matrix of a 2 node bar element. [2]

PART–B *(4x14 = 56 Marks)*

2. a) Consider a simple one dimension structure with three elements, explain the process of stiffness matrix and load vector assembly. [9]
   Explain plane stress and plane strain conditions with examples. [5]

3. a) Discuss about the types of elements used in domain discretization. [6]
   b) Write the properties of stiffness matrix. [3]
   c) Write the convergence requirements. [5]

4. For the beam shown in Figure below, determine the following: i) Slopes at nodes 2 and 3. ii) Vertical deflection at the mid-point of the distributed load. Consider all the elements have E=200GPa, I=5X10^6 mm^4



[14]

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5. Derive the strain displacement matrix of a constant strain triangle element [14]

6. a) Derive the shape functions of 4 node Isoparametric element. [7]

   b) Explain the use of numerical integration in Fem. Discuss about two point gauss quadrature method. [7]

7. Determine the temperature distribution in a fin of circular cross-section shown in fig. Base of the fin in maintained at 100^0C and tip of the fin is insulated. Thermal conductivity K=2w/cm^{0}C, Convective heat transfer co-efficient h=0.2w/cm^2 , $Ø_f$=20^0C (fluid temperature) and Diameter of the fin=1cm. Consider 3 elements. [14]