Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH (CIVIL) END SEMESTER EXAMINATIONS
DECEMBER 2020
SUBJECT: FINITE ELEMENT METHOD OF ANALYSIS [CIE 4015]

Date of Exam: 30/12/2020 Time of Exam: **9:00 AM to 12 NOON** Max. Marks: **50**

Instructions to Candidates:

- Answer ALL the questions & missing data, if any, may be suitably assumed

1A.	Explain the significance of geometric invariance and write the steps to ensure geometric invariance of a displacement function.	**3**
1B.	Analyze the bar shown in Fig.1B for applied load. Take A= 1200 mm^2 , E=$2.1\times10^5 N/mm^2$. P= 10kN.	**7**
2A.	What is transformation matrix? Derive transformation matrix for plane truss element.	**3**
2B.	Analyze the truss shown in **Fig.Q2B**. Take AE= 2×10^5 kN.	**7**
3	For the continuous beam shown in **Fig.Q3**, determine rotation and support reaction at C. Take EI= 4000kNm^2.	**10**
4A	Write the displacement model for CST and rectangular elements.	**2**
4B	Examine the validity of mapping for the 4-noded element defined by Cartesian coordinates {(0,0) ,(3,0), (3,7), (0,1)}units.	**8**
5A	A truss member is defined by coordinates (1,2) and (5,7) units, and the corresponding displacements are -0.1 units and 0.5 units in local direction. Determine i) global displacements, ii) displacement at midpoint of the member in local direction.	**4**
5B	Write the stiffness matrix in local direction and transformation matrix for a 2 noded plane frame element.	**3**
5C	Explain natural coordinates for CST element.	**3**

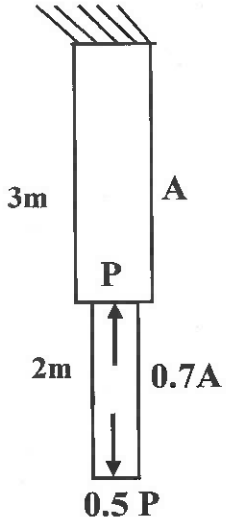

Fig. Q1B

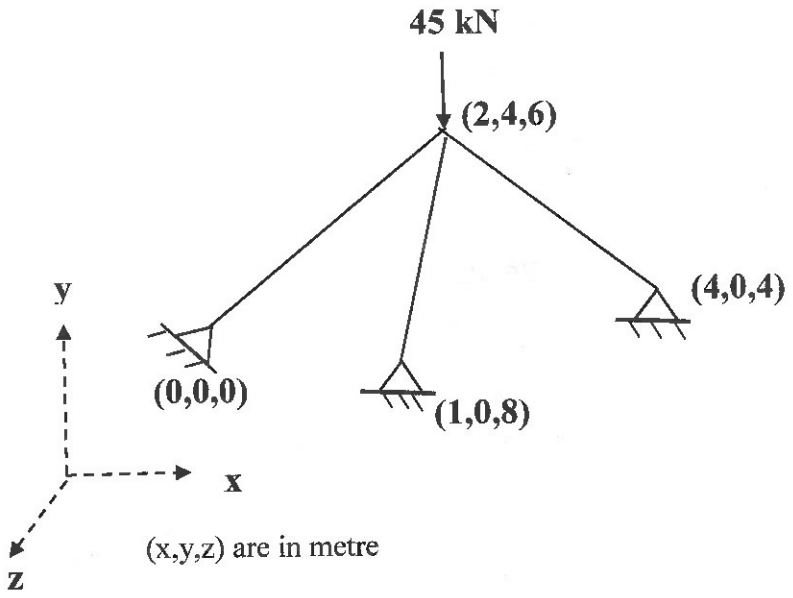

Fig. Q2B

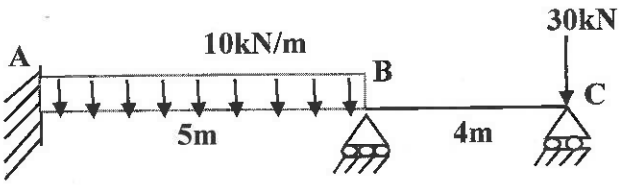

Fig. Q3