Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

M.Tech. Structural Engineering Winter 2018 Examination

Semester: 1 **Date: 10/12/2018**
Subject Code: 203209101 **Time: 10:30am to 1:00pm**
Subject Name: Advanced Structural Analysis **Total Marks: 60**

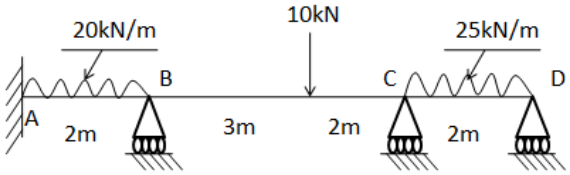
Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 A) Fill in the blanks: **(05)**

1. In stiffness member approach method R_T known as _____.
2. Transpose of the matrix $\begin{bmatrix} 3 & 8 \\ 7 & 2 \end{bmatrix}$ is _____.
3. The product of flexibility and stiffness is _____.
4. The beam member has _____ degrees of freedom.
5. Stiffness Matrix methods approaches are _____ and _____.

B) Objective Type of Question **(05)**

1. Definition of stiffness.
2. Explain actions and displacement.
3. Write formula SM matrix for one Member in Plane Frame.
4. Find out K.I. for given structure.



5. Advantages of stiffness matrix method.

C) Write the steps to find Sj matrix of Plane Truss. **(05)**

Q.2 Answer the following questions. (Attempt any three) (Each five mark) **(15)**

A) Prove that any [R] direction cosine for rotation matrix is $[R]^{-1}=[R]^{T}$

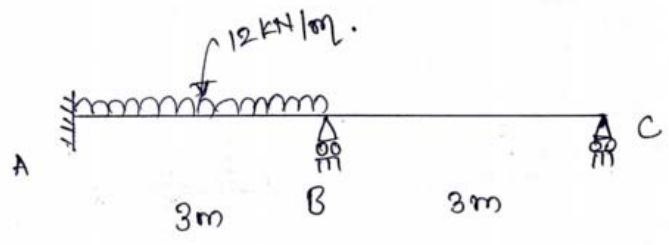
B) Explain the term 'Shape Functions'. Why polynomial terms are preferred for shape functions in finite element method ?

C) Explain the one, two and three dimensional polynomial shape functions.

D) Write short note on Galerkin's method.

Q.3 A) Calculate S_J Matrix and load vector for a beam as shown in figure using stiffness member approach. Considering the following secondary effects **(07)**

(1) Support A rotates by 0.001 radian clockwise.
(2) Support B settle downward by 5 mm.
(3) Member BC is subjected to temperature changes of 30^0C at top and 40^0C at bottom
EI=$20*10^3$kN.m^2,
AE=$10*10^3$KN,
$\alpha=12*10^{-6}$ /^{0}C take d=230mm

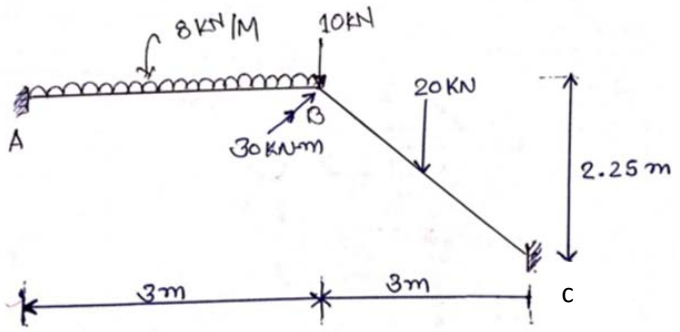


B) Find out Deformation matrix, support reactions and draw SF diagram.(same figure) **(08)**

OR

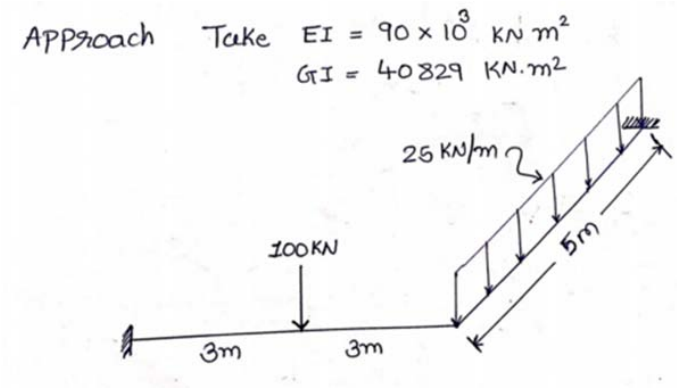
B) Find out Deformation matrix, end member actions and draw BM diagram.(same figure) **(08)**

Q.4 A) Calculate S_J Matrix as shown in rigid frame figure using stiffness member approach. **(07)**
Take, $E=2*10^8 kN/m^2$, $A=0.04m^2$, $I_z=2*10^{-3}m^4$.



OR

A) Calculate S_J Matrix as shown in grid frame in figure by stiffness member approach. **(07)**
$EI=90*10^3 kN.m^2$, $GJ=40829 kNm^2$



(8)

B) Obtain joint stifnees matrix of the Truss