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## UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: M. Tech (Structures)

Subject (Course): Matrix methods of structural Analysis

Course Code : CIVL 7003

No. of page/s: 3

Semester – I

Max. Marks : 100

Duration : 3 Hrs

Paper: I

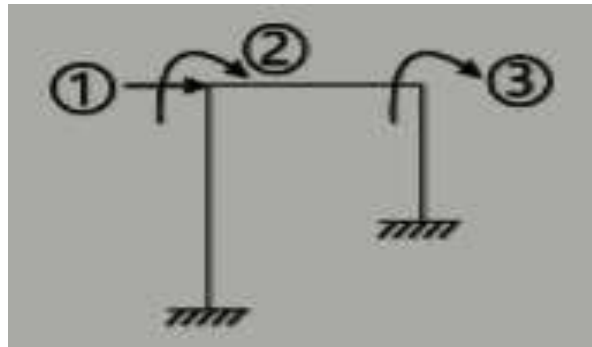
NOTE: Answer all questions from Part-A. Answer all questions from Part-B. Answer both questions from part-C. **Missing data should be suitably assumed & mention clearly**

### PART – A

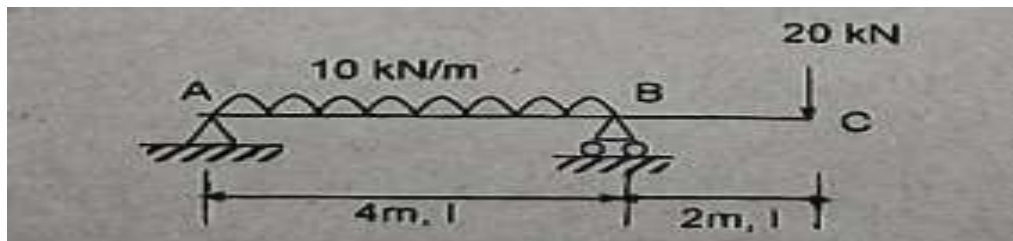
- Q.1 Explain Structure & element coordinates with suitable example 4 Marks CO3  
Q.2 Explain difference between kinematic indeterminacy of truss & frame. 4 Marks CO1  
Q.3 How do we assemble element stiffness to global stiffness matrix. 4 Marks CO4 & CO5  
Q.4 Explain the significance of generalized coordinates? 4 Marks CO4  
Q.5 Write down element flexibility matrix for beam & truss element? 4 Marks CO1

### PART – B

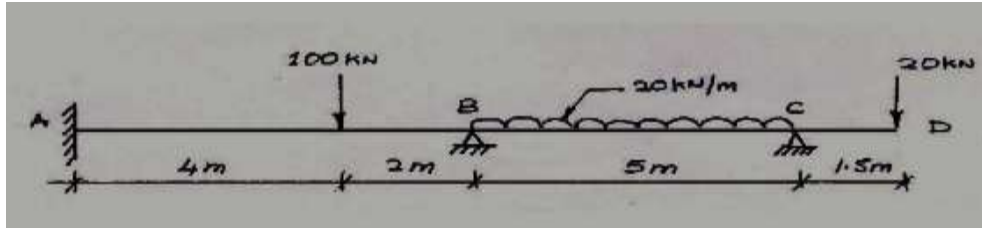
- Q.6 Generate the flexibility & stiffness matrix for the frame element shown in Figure below. **Adopt** element approach. 10 Marks CO5



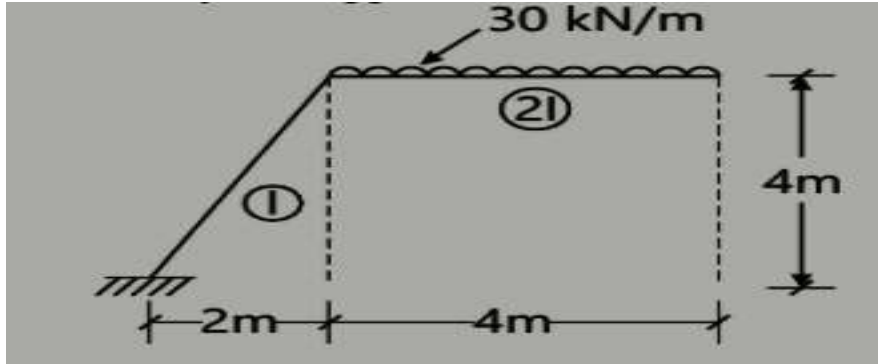
- Q.7 Determine the deflection at point B for the beam shown in figure below. Take the value of  $EI = 2400\text{kN.m}^2$ . **Adopt element approach.** 10 Marks CO2



- Q.8 Analyze the continuous beam shown in figure below by flexibility method. Draw B.M.D & S.F.D. **Adopt element approach.** 10 Marks CO1 & CO5

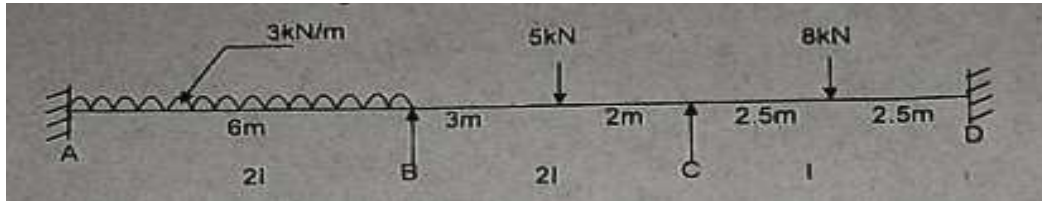


Q.9 Analyze the frame shown in figure below by flexibility method. Draw B.M.D. **Adopt element approach.** 10 Marks CO1 & CO5



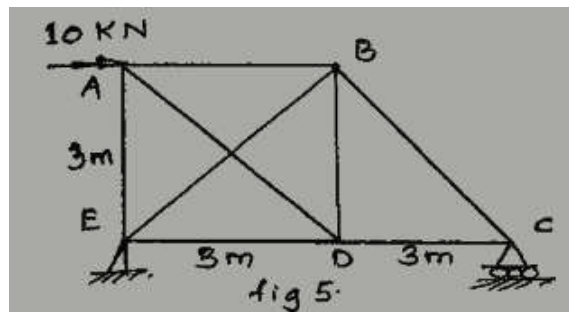
OR

Q.10 Analyze the beam shown in figure below by Stiffness method. Draw B.M.D & S.F.D for the same. **Adopt element approach** 10 Marks CO3 & CO5

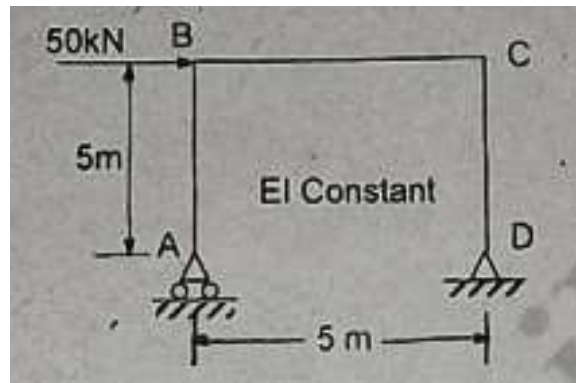


**PART – C**

Q.11 Analyze the statically indeterminate pin jointed truss shown in figure below & determine the bar forces. The cross section & E are same for all the members. **Adopt element approach.** CO3 & CO5  
20 Marks



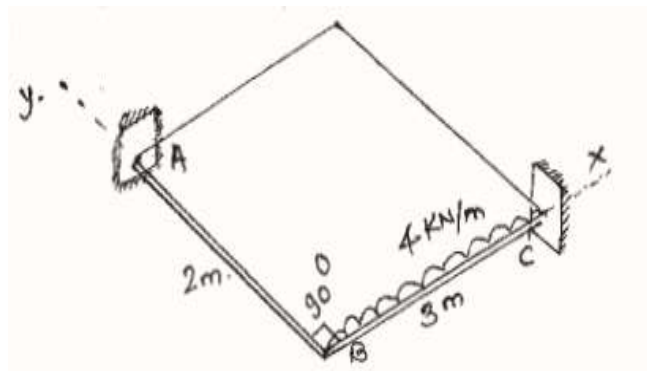
Q.12 Analyze the frame shown in figure below by stiffness method. Adopt element Approach. 20 Marks CO3 & CO4



OR

Q.13 Using structure approach develop the stiffness matrix for grid structures as shown in figure below.  
 Take  $E = 2 \times 10^5$ .  $I = 2 \times 10^5 \text{ mm}^4$ .  $G = 0.8 \times 10^8 \text{ Mpa}$ .

CO2 & CO5  
 20 marks



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Paper: II

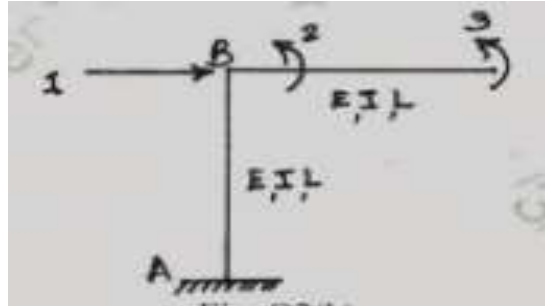
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### PART – A

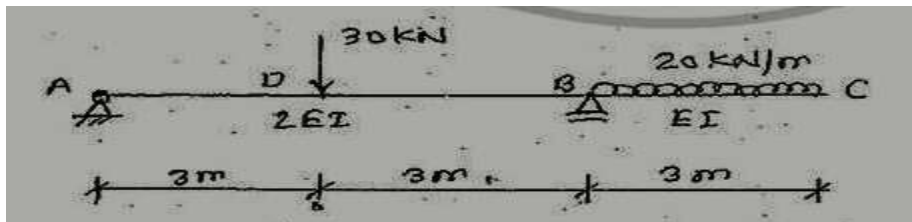
- Q.1 Explain why stiffness matrix is symmetric. 4 Marks CO3  
Q.2 what are requirements to be satisfied for analyzing structure. 4 Marks CO1  
Q.3 Develop the relationship between member flexibility matrix  $[F_m]$  & structure flexibility matrix. 4 Marks CO5  
Q.4 Explain element & structure coordinate with suitable example. 4 Marks CO3  
Q.5 Prove that flexibility matrix is inverse of stiffness matrix. 4 Marks CO1 & CO2

### PART – B

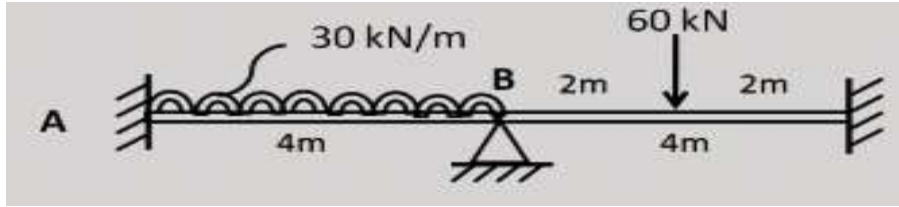
- Q.6 Generate the flexibility & stiffness matrix for the beam element shown in Figure below. Adopt element approach. 10 Marks CO5



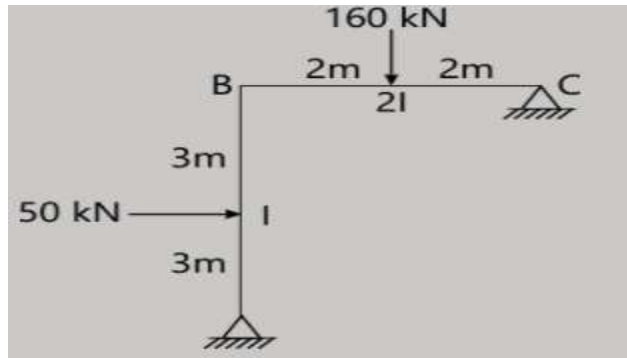
- Q.7 Determine the maximum deflection at Point D for the beam shown in figure below. Take the value of  $EI = 2600\text{kN.m}^2$ . Adopt element approach. 10 Marks CO2



- Q.8 Analyze the continuous beam shown in figure below by flexibility method. Draw B.M.D & S.F.D. Adopt element approach. 10 Marks CO1 & CO5

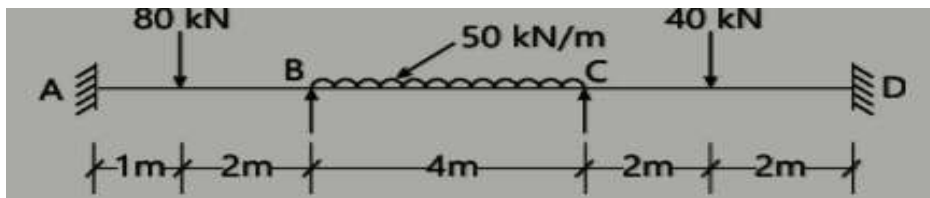


Q.9 Analyze the frame shown in figure below by flexibility method. Draw B.M.D. **Adopt element approach.** 10 Marks CO1 & CO5



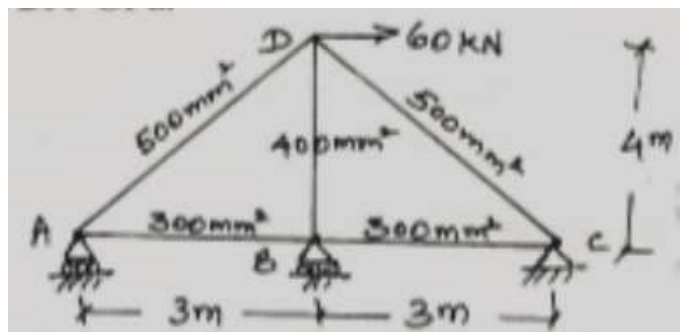
OR

Q.10 Analyze the beam shown in figure below by Stiffness method. Draw B.M.D & S.F.D for the same. **Adopt element approach** 10 Marks CO3 & CO5

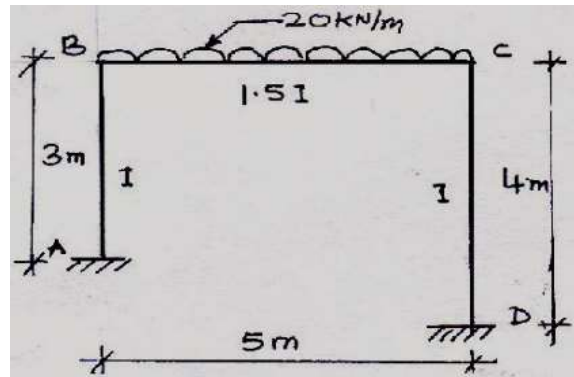


PART - C

Q.11 Analyze the statically indeterminate pin jointed truss shown in figure below & determine the bar forces. The cross section & E are same for all the members. **Adopt element approach.** CO3 & CO5  
20 Marks



Q.12 Analyze the frame shown in figure below by stiffness method. **Adopt element Approach** 20 Marks  
CO3 & CO4



OR

Q.13 Analyze & draw B.M.D for the grid frame shown in figure below by stiffness method. 20 Marks  
CO2 & CO5

