BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

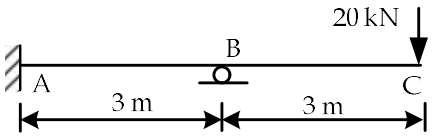
CLASS: B.TECH. **SEMESTER : IV**
BRANCH: CIVIL **SESSION : SP/2023**

SUBJECT: CE207 STRUCTURAL ANALYSIS – II

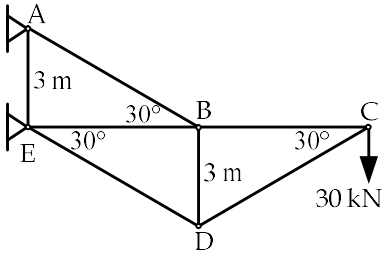
TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

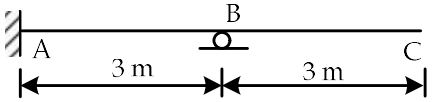
			CO	BL
Q.1(a)	Write-down the differences between force method and displacement method of analyzing indeterminate structures.	[5]	1	K1
Q.1(b)	Continuous beam ABC 6m long and is loaded as shown in the figure. Support A is a fixed support and B is a roller support. Using the force method calculate the support reactions of the beam. Consider the flexural rigidity (EI) to be constant throughout the beam length.	[5]	1	K3



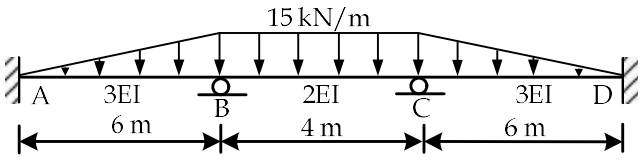
Q.2(a)	Find the vertical reaction at support E of the truss shown in the figure given below. Cross-sectional area and modulus of elasticity for all the members are 500 mm^2 and 200 GPa, respectively.	[5]	2	K3



Q.2(b)	Continuous beam ABC is 6m long. Support A is a fixed support and B is a roller support. Draw the influence line diagram (ILD) for the vertical reaction at B. Computes the ordinates at intervals of 1 m. If a vertically downward point load of 10 kN acts on point C, calculate the reaction at B using the ILD. Consider the flexural rigidity (EI) to be constant throughout the beam length.	[5]	2	K3



Q.3(a)	Solve the continuous bam ABCD (given in the figure) using slope deflection method to compute the moments at A and D. Variation of Flexural rigidity (EI) is shown in the figure.	[5]	3	K4



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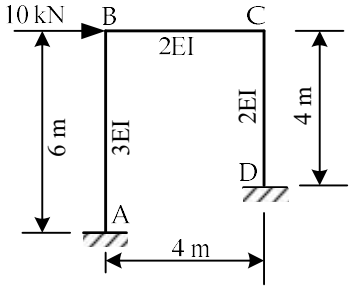
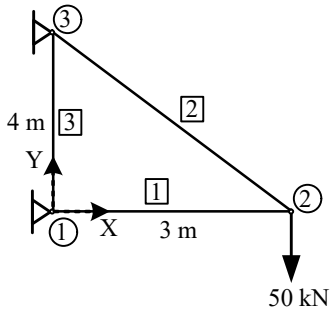
Q.3(b) A portal frame ABCD is loaded with a horizontal point load at point B as shown in the figure. State whether the structure will experience side sway or not with proper justification. Solve the frame using moment distribution method to draw the bending moment diagram. Also draw the deflected shape showing the point of contraflexure. [5] 5 K4



Q.4(a) A two nodded truss member have length **L**, cross sectional area **A**, modulus of elasticity **E** and inclination with the global x-axis **θ**. Derive the relation between the stiffness matrix in local co-ordinate system and stiffness matrix in global co-ordinate system for the truss element. [5] 4 K2

Q.4(b) The plane truss shown in the figure is subjected to a downward vertical load at node 2. Calculate the element stiffness matrix for element 1 and 2 in global co-ordinate system. For all elements, A = 0.2 m^2, E = 200 GPa. Also mention the boundary conditions need to be incorporated to solve the problem using stiffness matrix approach. [5] 4 K3



Q.5(a) With help of suitable examples, discuss the steps involved in solving two hinged and fixed arch system. [5] 3 K2

Q.5(b) A parabolic two hinge arch has a span of 40 m and a rise of 10 m. A uniformly distributed load of 10 kN/m covers the extreme right 10 m horizontal span of the arch. If $I=I_0 \sec\theta$, where θ is the inclination of the arch at any section to the horizontal and I_0 is the moment of inertia of the crown section. Find out the horizontal thrust at hinges and bending moment at a section horizontally 10 m from the left hinge. [5] 3 K3

::::::24/04/2023::::::M