MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

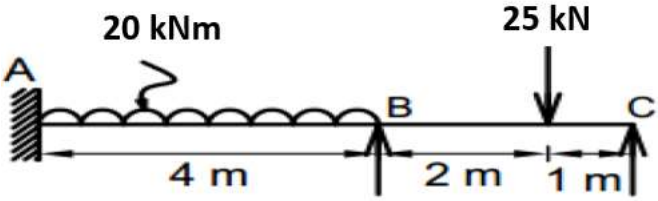
DEPARTMENT OF CIVIL ENGINEERING

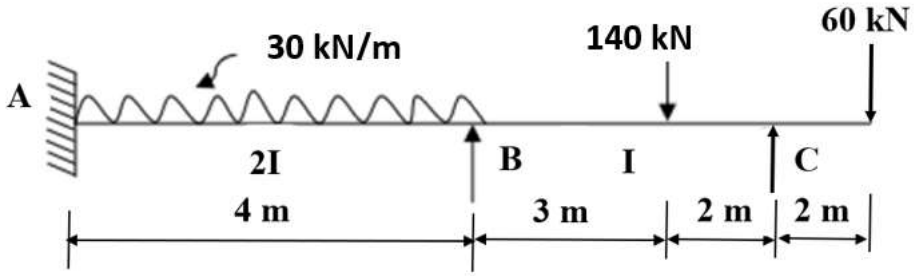
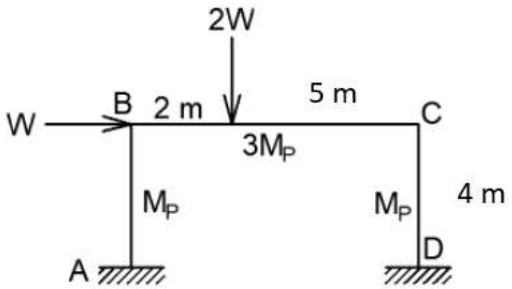
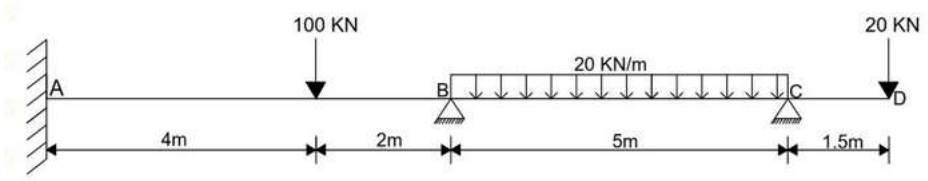
V SEMESTER B.TECH.

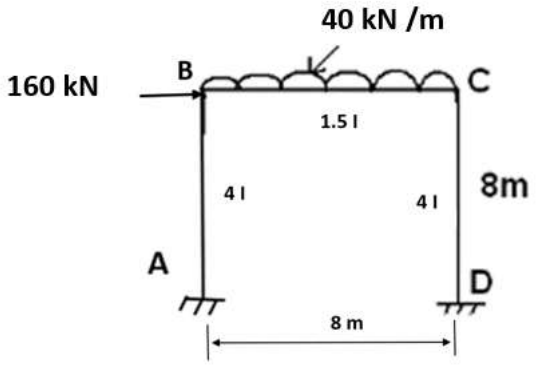
End Semester exam (Makeup)

SUBJECT: Analysis of Indeterminate Structures (CIE 3151)

DATE: XX-11-2023 **TIME: XX**

Q. No		M	CO	BL
1a	A two hinged parabolic arch of span 30m and central rise 2.5m carries an udl of 30kN/m on the left half of the span and a point load of 135 kN at the crown. Find the reactions at the support and the bending moment at the crown.	**5**	**CO1**	**3**
1b	Develop stiffness matrix for bar element with two degree of freedom. 	**3**	**CO5**	**6**
1c	List the assumptions made in fully plastic moment of a section.	**2**	**CO4**	**1**
2a	Analyse the continuous beam shown in figure by using three moment theorem method. The support *B* settles by 5mm below *A* and *C*. Assume *EI* to be constant for all members and E = 200 GPa, I = 8 x 10^6 mm^4. Draw BMD. 	**5**	**CO2**	**4**
2b	Derive the relation between flexibility and stiffness of a material considering the example of cantilever beam subjected to load P as shown in the figure. 	**3**	**CO5**	**6**
2c	Define: (a) Distribution factor (b) Fixed end moments	**2**	**CO3**	**1**

3a	Determine the structural stiffness matrix for the continuous beam ABC shown in figure by stiffness method. 	**5**	**CO5**	**3**
3b	Two point loads of 200 kN and 300 kN spaced 4 m apart cross a girder of span 20 m from left to right with the 200 kN leading. Draw the ILD for shear force and bending moment and find the values of maximum shear force and bending moment at a section 5m from the left-hand support.	**3**	**CO6**	**4**
3c	Define stiffness coefficient k_{ij}.	**2**	**CO5**	**1**
4a	Determine the value of collapse load for the portal frame shown in the figure by beam, sway and combined mechanism. 	**5**	**CO4**	**3**
4b	Determine the force matrix for the beam shown in the figure using stiffness method. 	**3**	**CO5**	**3**
4c	Two wheel loads 200 kN and 80 kN spaced at 2m apart move on the girder of span 16m. Determine the maximum bending moment that can occur at a section 6 m from the left end. Any wheel load can lead the other.	**2**	**CO6**	**3**
5a	Determine the structural displacement matrix for the frame shown in figure using displacement method.	**5**	**CO5**	**3**

				
5b	A simply supported beam has a span of 20 m and subjected to an UDL of 20 kN/m, 6 m long travelling from left to right. Draw the ILD for shear force and bending moment at a section 8 m from the left end. Use these diagrams for calculating the maximum BM and SF at this section.	**3**	**CO6**	**4**
5c	Illustrate the reason for differentiating the frames as symmetric frames. What mechanisms are used to analyze it?	**2**	**CO4**	**4**