MANIPAL INSTITUTE OF TECHNOLOGY

FIFTH SEMESTER B.TECH (CIVIL ENGINEERING)

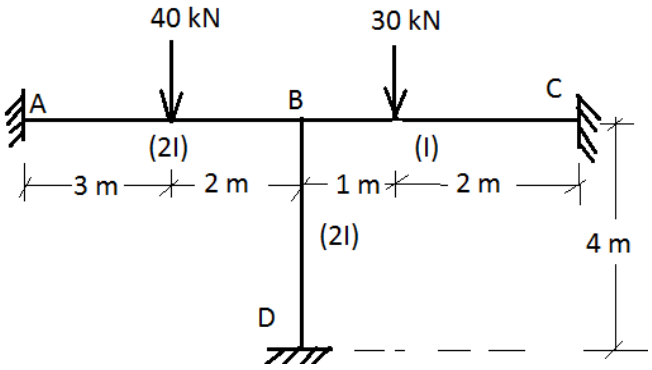
END SEMESTER EXAMINATION, NOV 2022

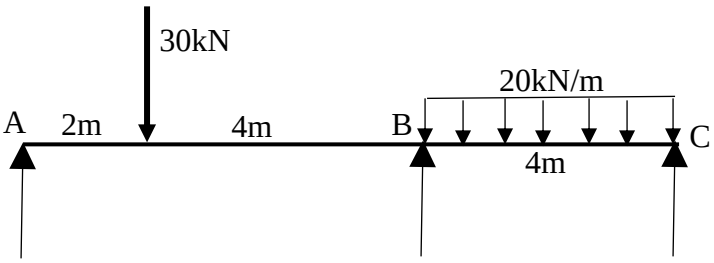
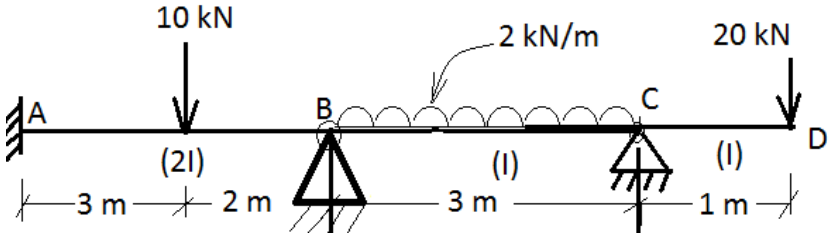
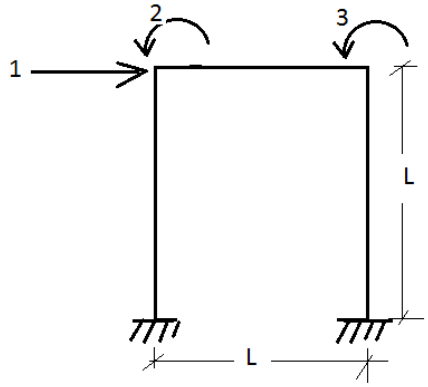
ANALYSIS OF INDETERMINATE STRUCTURES (CIE 3151)

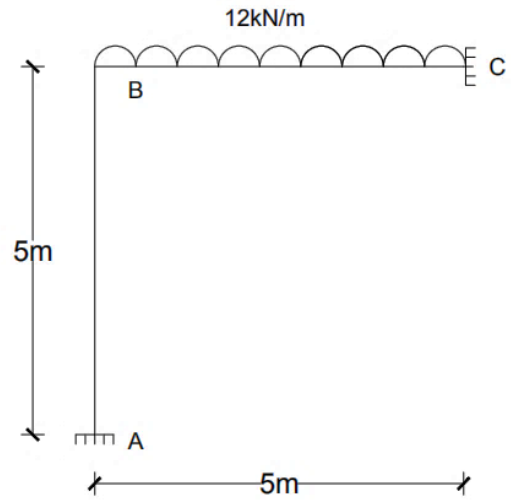
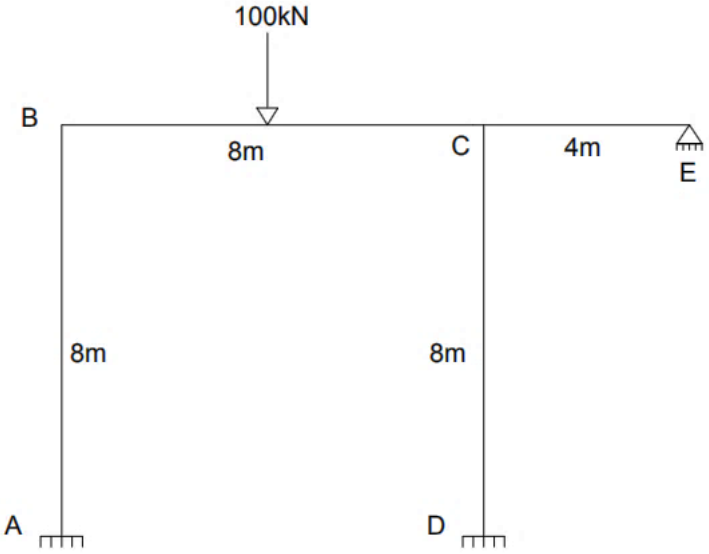
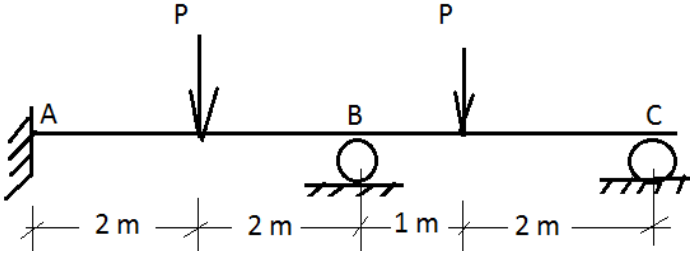
(22 –11 - 2022)

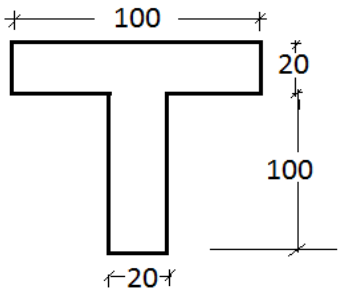
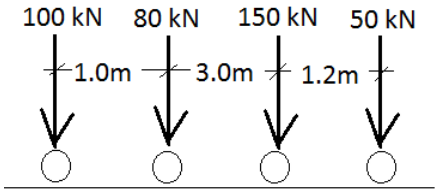
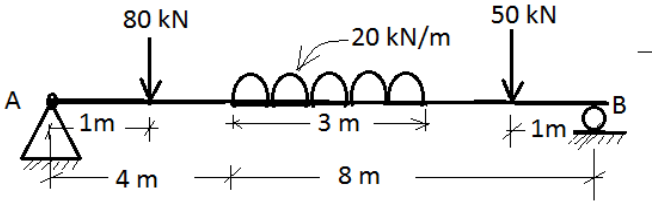
TIME: 3 HRS. **MAX. MARKS: 50**

Note: 1. Answer all questions.
2. Any missing data may be suitably assumed.

Q. NO	QUESTION	MARKS	CO	BL
1A	A two hinged parabolic arch, AB of span 40 m and central rise 8 m, carries a concentrated load of 100 kN at 8 m from left support A and an UDL of 30kN/m over the right half span. Obtain the bending moment, normal thrust and radial shear at 8m from right support (B).	**5**	**CO1**	**4**
1B	A propped cantilever AB of span 6 m carries an UDL of 20 kN/m throughout the span and a concentrated load of 40 kN at 2 m from left fixed support A. Analyze for support reactions using Strain Energy method (Castigliano's theorem). Draw SFD.	**3**	**CO2**	**4**
1C	A fixed beam AB of span 4m, carries an UDL of 20 kN/m throughout the span and a concentrated load of 60 kN at 1m from left support B. Determine the bending moment in beam under the point load.	**2**	**CO2**	**4**
2A	Analyse the frame loaded as shown in the figure for end moments. Use Moment Distribution method and sketch BMD. 	**5**	**CO3**	**4**
2B	A two span continuous beam ABC carries an UDL of 40 kN/m throughout both the spans. Left support A is fixed and the other two supports (B&C) are hinged. Span AB = 5 m and Span BC = 3 m.	**3**	**CO2**	**4**

	Analyze for end moments using Clapeyrons theorem of Three Moment. Take constant EI throughout.			
2C	Analyze the continuous beam ABC shown in figure using theorem of Three Moment for end moments at the supports. Take constant EI throughout. 	**2**	**CO2**	**4**
3A	Analyse the continuous beam ABCD, supported and loaded as shown in the figure using Displacement (Stiffness) method to find end moments. 	**5**	**CO3**	**4**
3B	Generate the stiffness matrix for the frame with coordinates as shown in the figure. Take constant EI. 	**3**	**CO3**	**4**
3C	Figure shows frame ABC, fixed at joint A and C and loaded with udl of 12 kN/m over member BC. Find the rotation at the joints. Assume constant EI for the member AB and BC.	**2**	**CO3**	**4**

				
4A	Analyse the loaded frame shown in the figure using Displacement (Stiffness) method for displacements at the joints. Take constant EI. 	**5**	**CO3**	**4**
4B	A two span continuous beam of uniform cross-section is fixed at end A and simply supported at B and C, as shown in the figure. The loading on each span is shown. Determine the collapse load in terms of plastic moment. Take EI as constant throughout. 	**3**	**CO4**	**4**
4C	Determine the plastic moment for the section shown in the figure using plastic analysis. Take yield stress as 250 MPa.	**2**	**CO4**	**4**

				
5A	The wheel loads shown in the figure roll over a girder of span 15 m with 50 kN load in lead, leading from left to right. Determine, (a) the absolute maximum bending moment for the girder (b) maximum bending moment at section 5 m from the left support. 	**5**	**CO5**	**4**
5B	Three wheel loads 30 kN, 80 kN and 50 kN, spaced at 3.0 m apart from each other, with 50 kN load in the lead, passes over a simply supported beam of span 12 m from **right to left**. Determine the maximum shear force at section 4 m from the left support.	**3**	**CO5**	**4**
5C	The figure shows a simply supported beam of span 12 m. Draw ILD for shear force at section 4 m from the left support. If the beam is loaded as shown, evaluate the shear force at the section 4 m from the left support using ILD. 	**2**	**CO5**	**3**