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V SEMESTER B.TECH (CIVIL) END SEMESTER EXAMINATIONS

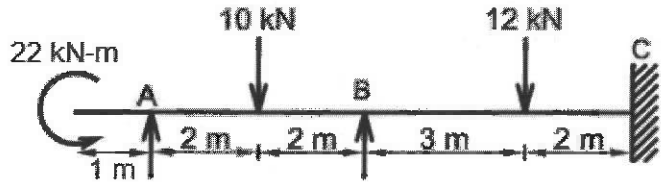
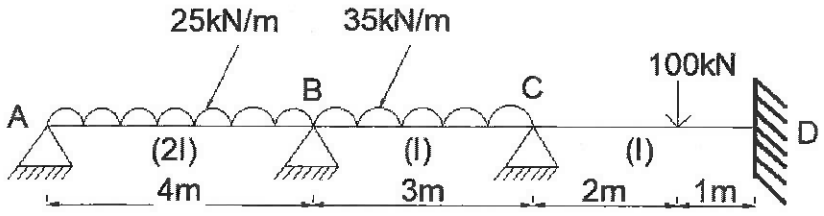
JANUARY 2021

SUBJECT: ANALYSIS OF INDETERMINATE STRUCTURES [CIE 3151]

Date of Exam: Time of Exam: Max. Marks: **50**

Instructions to Candidates:

- Answer ALL the questions & missing data may be suitably assumed

1A.	Analyse the continuous beam ABC shown in the figure using Clapeyron's theorem. Draw BMD. 	5
1B.	A two hinged parabolic arch of rise 10m and span 45m is loaded with an udl of 30 kN/m throughout the span and a point load of 150 kN at crown. Calculate maximum positive bending moment. Also calculate normal thrust and radial shear at crown.	3
1C.	A simply supported girder of span 10m is subjected to a rolling uniform distributed load of 50 kN/m longer than the span. Determine maximum negative shear force at a section 2.5 m from left support.	2
2A.	Analyse the continuous beam ABCD shown in the figure using moment distribution method for support moments (perform at least 4 cycles) if support A sinks by 15mm. Young's modulus of concrete beam material E = 27 GPa and moment of inertia I = $5.2X10^8$ mm^4. 	5

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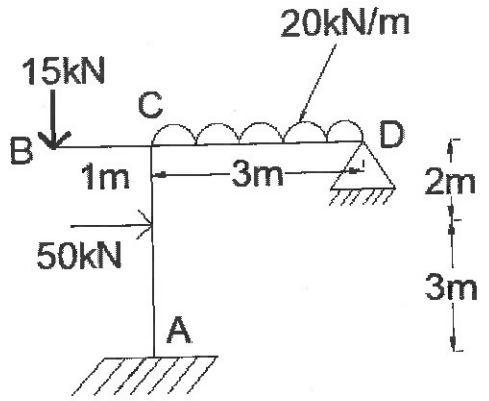
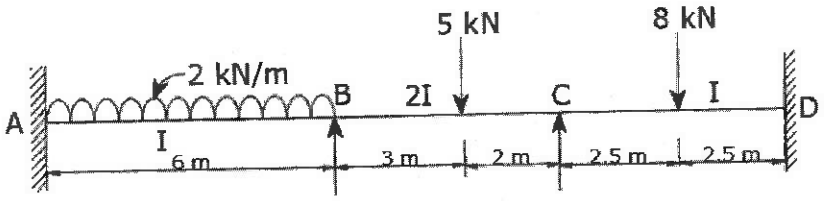
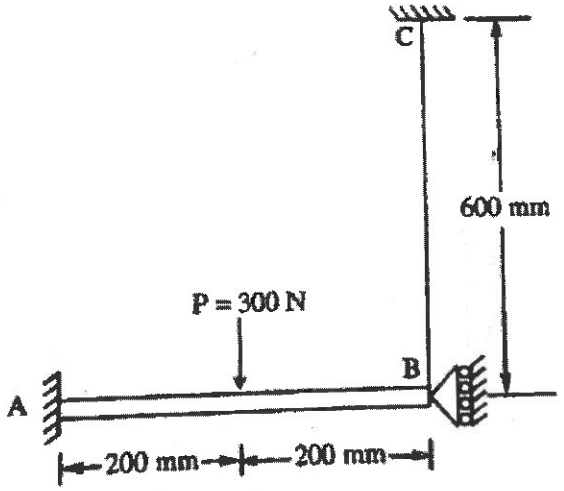
2B.	Determine the rotations at supports for the frame ACD shown in the figure using slope-deflection method. 	3
2C.	Determine degrees of freedom for the following structures:  a).  b).	2
3A.	Determine collapse loads for a frame ABCD shown in the figure for sway and combined mechanisms using principle of virtual work.	5

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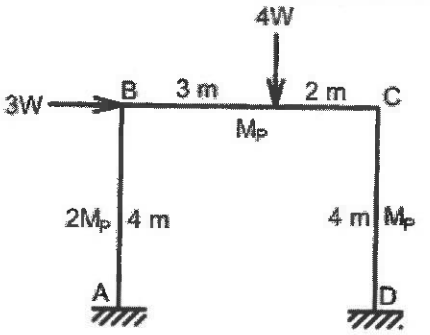
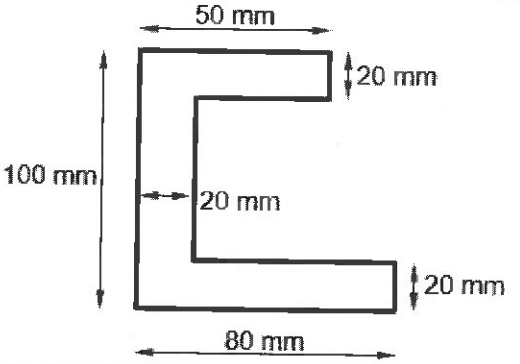
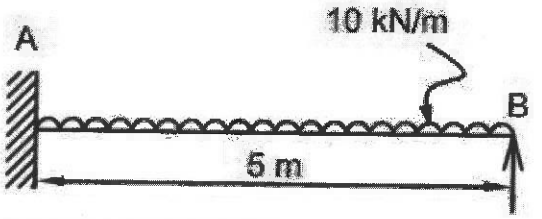
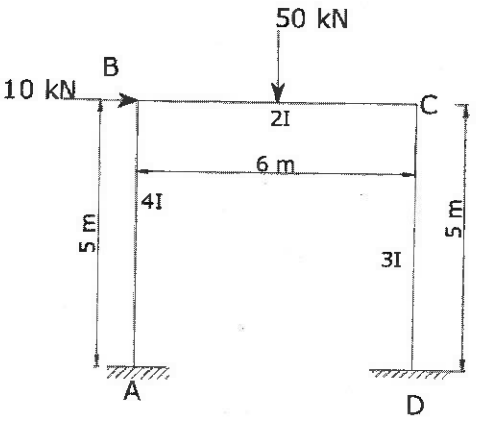
		
3B.	Determine the shape factor for a channel-section shown in the figure. 	3
3C.	Determine support reaction at B for a propped cantilever beam AB shown in the figure using Castigliano's second theorem. 	2
4A.	Determine the structural stiffness matrix for a frame shown in the figure using stiffness method. 	5

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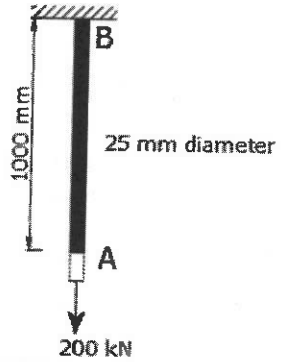
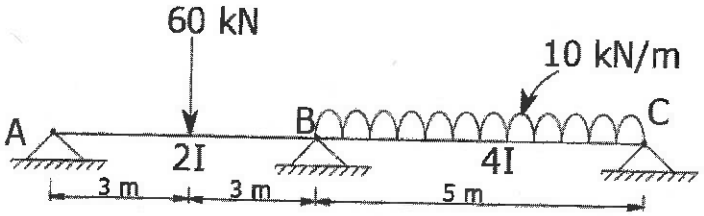
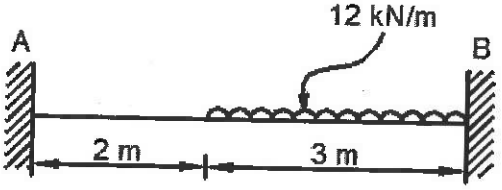
4B.	Derive the stiffness matrix for a cantilever beam AB with one rotation at 'B' as shown in the figure using first principle. 	**3**
4C.	A 1 m long circular bar of diameter 25 mm subjected to an axial load of 200 kN cause linear expansion of 0.01 mm as shown in the figure. If a bar has Young's modulus of 210 GPa, determine the stiffness and flexibility of the axial bar element. 	**2**
5A.	Develop the displacement transformation matrix and system force matrix for a continuous beam ABC beam shown in the figure using stiffness matrix method. 	**5**
5B.	Determine support reactions for a fixed beam shown in the figure using consistent deformation method if support B settles down by 8mm. Take EI = 24 X 10^3 kNm^2 	**3**
5C.	A single rolling load of 100 kN moves on a simply supported girder of span 20 m. Construct influence line diagram for shear force and bending moment diagrams at a section 5 m from the left support.	**2**