Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (S,FE) (FT/WP), (S3 PT) Examination May 2025 (2019 Scheme)

Course Code: CET 301

Course Name: STRUCTURAL ANALYSIS - I

Max. Marks: 100 Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks)

		Marks
1	Describe the method of sections for analysing trusses.	3
2	State 'Castigliano's Theorem - Part I' and mention its use.	3
3	State Maxwell's Law and show its application using a sketch.	3
4	Show how problems involving lack of fit in a truss are solved using consistent deformation method.	3
5	Show three reasons for sway in frames.	3
6	What is 'Distribution Factor' used in 'Moment Distribution Method' and how is it obtained?	3
7	Show how cable tensions are obtained for a cable subjected to concentrated loads.	3
8	Obtain the expression for the length of a cable subjected to uniformly distributed load.	3
9	State 'Eddy's Theorem' and show its application using a sketch.	3
10	Show the position of a uniformly distributed load of length 'l' shorter than span 'L' of a simply supported beam for maximum bending moment at a point 'c' from the left support.	3

PART B

(Answer one full question from each module, each question carries 14 marks)

Module -1

11	**Figure 1** shows a loaded truss of span 12 m. Determine the support reactions, analyse using method of joints and tabulate the forces in all the members.	14

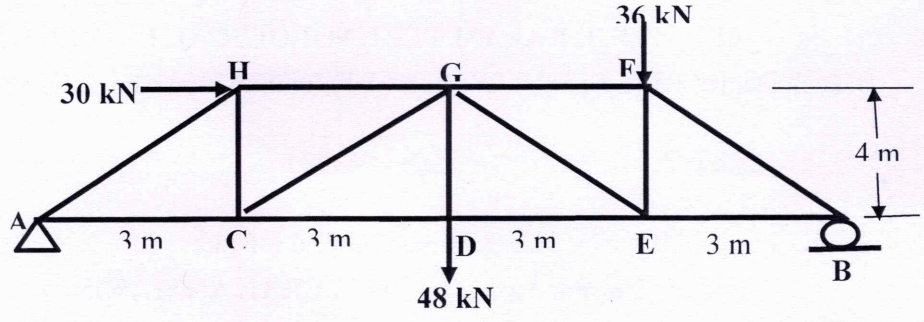

Figure 1

12 **Figure 2** shows a loaded beam of span 8 m. Compute the deflection at C, slope at D and the maximum deflection using successive integration method. E = 200 GPa and I = $80*10^6$ mm^4. 14

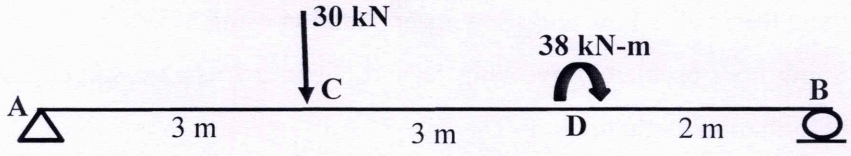

Figure 2

Module -2

13 **Figure 3** shows a loaded truss of span 9 m. Compute the vertical deflection at D using unit load method. E = 200 GPa and cross sectional area is 750 mm^2 for all the members. 14

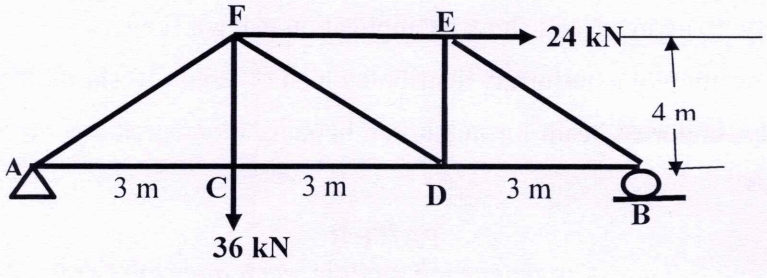

Figure 3

14 **Figure 4** shows a loaded beam of span 10 m. Analyse using consistent deformation method and draw the BMD. 14

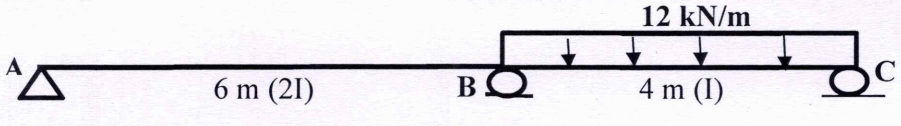

Figure 4

Module -3

15 **Figure 5** shows a loaded beam of span 9 m. Analyse using 'Slope Deflection Method', determine the end moments and draw the SFD and BMD. 14

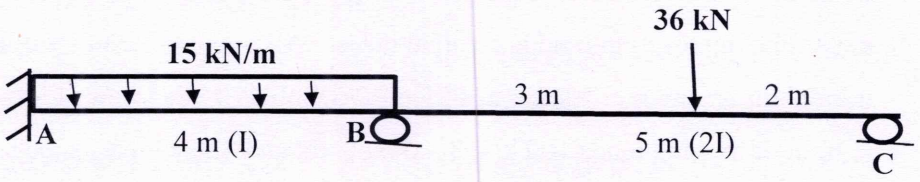

Figure 5

16 **Figure 6** shows a loaded frame. Analyse using 'Moment Distribution Method', determine the end moments and draw the BMD. 14

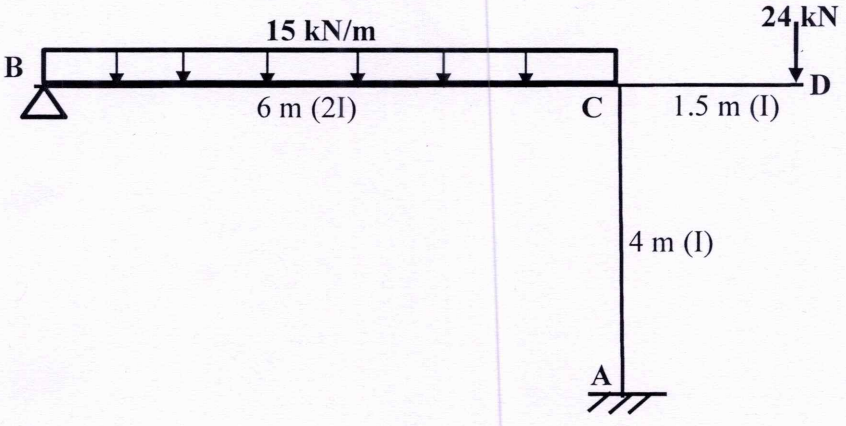

Figure 6

Module -4

17 A cable is hanging between two supports A and B at a horizontal distance of 60 m. The right support is 5 m below the left support. Two concentrated loads of 45 kN and 60 kN are hanging from points C and D at horizontal distances of 20 m and 40 m respectively from support A. Point D is 3 m below support B. Determine the support reactions, cable tensions with its angles and the length of the cable. 14

18 A cable of horizontal span 150 m is subjected to a uniformly distributed load of 18 kN/m. The dip of the cable is 30 m. It is clamped to a saddle with smooth rollers resting on top of a pier balanced by a cable inclined at 42^0 to the horizontal. Determine the maximum cable tensions, length of the cable, tension in the anchor cable and the forces on the supporting pier. Also determine the forces on the pier if the support is changed to pulley support. The pier is 12 m high. 14

Module -5

19	A three-hinged arch of horizontal span AB = 24 m has a rise of 6 m. It is subjected to a uniformly distributed load of 15 kN/m over the left half and a concentrated load of 90 kN at D, 3 m horizontally to the right of the middle hinge C. Analyse and determine the reactions and horizontal thrust. Also determine the bending moment, normal thrust and radial shear at E, 5 m horizontally to the right of left support A.	14
20	A train of moving loads 100 kN, 80 kN, 60 kN and 120 kN (distance between each load being 2 m) is moving from left to right (100 kN leading) on a simply supported beam of span AB = 24 m. Compute the maximum SF and BM at a point C, 6 m from right support B. Also, determine the absolute maximum shear force in the beam.	14

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