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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (R, S) / S3 (PT) (R, S) Examination December 2023 (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	Write two differences between method of joints and method of sections.	3
2	State the 'Moment Area Theorem' with an example.	3
3	Show how unit load method is applied for finding deflection of a truss and state the formula.	3
4	Show how consistent deformation method is used to find the prop reaction of a cantilever beam.	3
5	Write down the slope-deflection equation for the near end of a beam with fixed end and describe the terms.	3
6	What is carry-over factor used in 'Moment Distribution Method'? Show how it is obtained for a member with fixed far end.	3
7	Draw a neat sketch showing the major components of a suspension bridge.	3
8	Describe the pulley support for a suspended cable with the help of a sketch and show the forces acting on it.	3
9	Show how 'Normal Thrust' and 'Radial Shear' are obtained for a three-hinged arch.	3
10	Draw the influence line for reactions in a simply supported beam of span 'L' with overhang 'a' on the right side.	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 16 m. Determine the support reactions, analyse using method of joints and tabulate the forces in all the members.	14

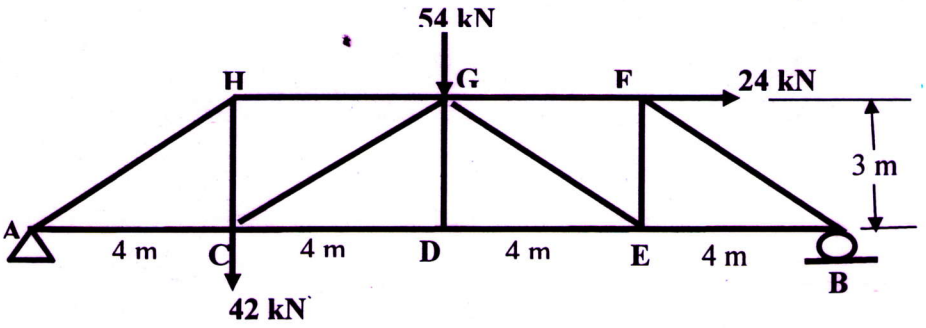

Figure 1

12 **Figure 2** shows a loaded cantilever beam of span 7 m. Compute the deflections at B, C & D and slope at D using moment area method. E = 200 GPa and I = $120*10^6$ mm^4. 14

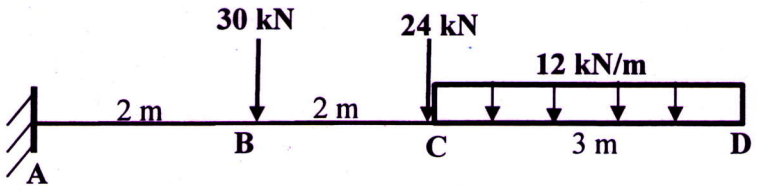

Figure 2

Module -2

13 **Figure 3** shows a loaded beam of span 10 m. Compute the vertical deflection at D using unit load method. E = 200 GPa and I is $60*10^6$ mm^4. 14

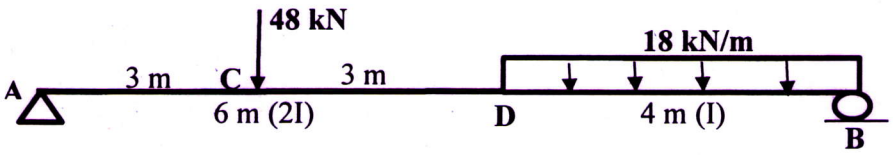

Figure 3

14 **Figure 4** shows a propped cantilever beam of span 5 m propped at B. Analyse using consistent deformation method and draw the BMD. 14

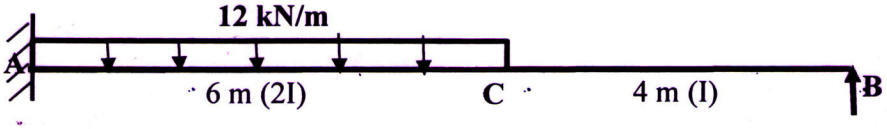

Figure 4

Module -3

15 **Figure 5** shows a loaded frame. Analyse using 'Slope Deflection Method', determine the end moments and draw the BMD. 14

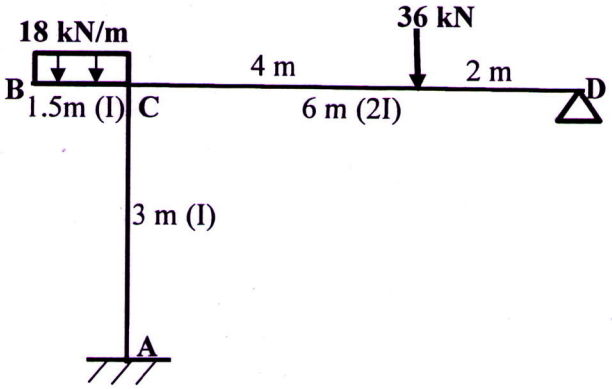

Figure 5

16 **Figure 6** shows a loaded beam of length 11 m. Analyse using 'Moment Distribution Method', determine the end moments and draw the BMD. 14

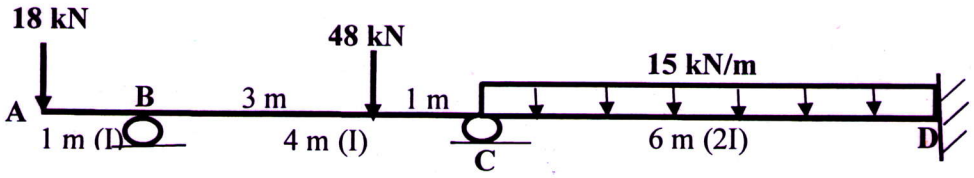

Figure 6

Module -4

17 A cable is hanging between two supports A and B at a horizontal distance of 80 m. Three concentrated loads of 30 kN, 40 kN and 50 kN are hanging from points C, D and E at horizontal distances of 30 m, 50 m & 60 m respectively from support A. Point C is 5 m below supports A and B. Determine the support reactions, cable tensions with its angles and the length of the cable. 14

18 A cable of horizontal span 90 m is hanging between two hinged supports A and B and is subjected to a uniformly distributed load of 24 kN/m. The left support A is 5 m above support B and the bottom-most point of the cable is 5 m below right support B. The left side of the cable is clamped to a saddle with smooth rollers resting on top of a pier balanced by a cable inclined at 30^0 to the horizontal. Determine the maximum cable tension, tension in the anchor cable and the forces on the supporting pier. 14

Module -5

19	A three-hinged arch of horizontal span AB = 36 m has a rise of 9 m. It is subjected to a uniformly distributed load of 12 kN/m over the right half and a concentrated load of 75 kN at D, 12 m horizontally to the left 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, 9 m horizontally to the left of right support B.	14
20	A train of moving loads 60 kN, 50 kN, 40 kN and 50 kN (distance between each load being 2.5 m) is moving from left to right (60 kN leading) on a simply supported beam of span AB = 30 m. Compute the maximum SF and BM at a point C, 10 m from left support A. If a uniformly distributed load 25 kN/m and 7.5 m long is moving on the beam, determine the absolute maximum BM anywhere in the beam.	14

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