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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (S,FE) (FT/WP/S3PT) Examinations June 2026 (2019 Scheme)

Course Code: CET301

Course Name: STRUCTURAL ANALYSIS - I

Max. Marks: 100 Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks) Marks

1	Differentiate between method of joints and method of sections.	3
2	State and explain Castigliano's theorem	3
3	State Betti's Theorem with neat sketch	3
4	Distinguish between force and displacement method of analysis	3
5	Write the basic equation used for Slope- Deflection method of analysis and explain each term.	3
6	Explain the terms: a) Flexural stiffness of a member b) Carry over factor	3
7	Explain with neat figure the main components of suspension bridges.	3
8	With neat sketch, discuss the profile/shape of cable subjected to uniformly distributed load 'w' per unit horizontal length.	3
9	Differentiate between beam and arch action.	3
10	Draw the ILD for the bending moment and shear force at a section in the span of a cantilever beam.	3

PART B

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

Module -1

11	a)	Analyse the plane truss given in Figure 1 by the method of joints and tabulate the forces in all the members.	14

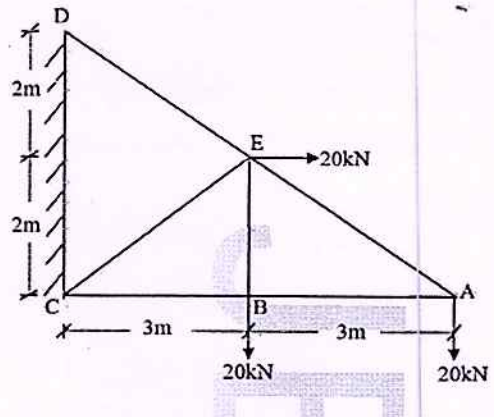

Figure 1

12 a) Determine the slope and deflection at the free end of a cantilever beam of span 4m using Moment Area method. The cantilever has a concentrated load of 20kN at a distance of 2 m from the fixed end and another concentrated load of 10 kN at the free end. Take EI = 4000 kNm^2. 8

b) Determine the slope and deflection at the free end of a cantilever with udl 'w' on whole span using double integration method. 6

Module -2

13 a) Describe the steps involved in analysis of indeterminate beams by consistent deformation method. 6

b) Using the Method of Consistent Deformation, determine the reaction at the prop of a propped cantilever beam of span L, subjected to a uniformly distributed load 'w' over the entire span. 8

14 a) Determine the deflection at the free end of the cantilever using strain energy method. Given E = 2x 10^5 N/mm^2 and I = 12x 10^6 mm^4

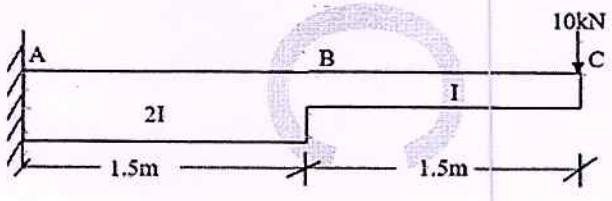

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Figure 2

b) State Maxwell's law of reciprocal deflections. 4

Module -3

15 a) Analyse the frame shown in figure 3 by slope deflection method and draw bending moment diagram. 14

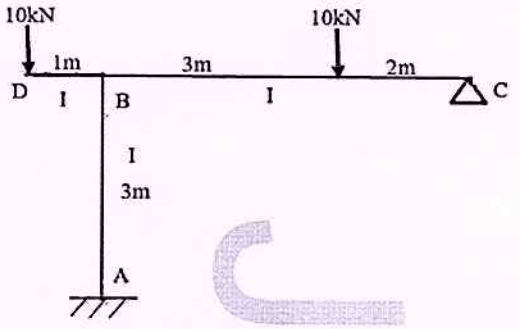

Figure 3

16 a) Analyse the continuous beam by moment distribution method. EI is constant.

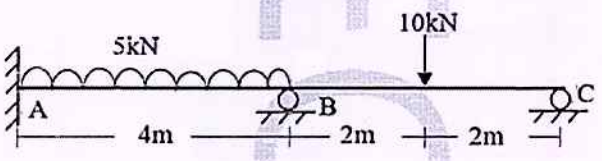

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Figure 4

Module -4

17 a) A cable is hanging between two supports A and B at a horizontal distance of 60 m. Three concentrated loads of 10 kN, 30 kN and 20 kN are hanging from points C, D and E at horizontal distances of 15 m, 30 m & 45 m respectively from support A. Point C is 3 m below supports A and B. Determine the support reactions, cable tensions with its angles and the length of the cable. 14

18 a) A cable of span 100 m and dip 8 m carries a load of 10kN/m of horizontal span. Find the maximum tension in the cable and the inclination of the cable at the support. Find the forces transmitted to the supporting pier if the cable passes over smooth pulleys on top of the pier. The anchor cable is at 30° to the horizontal. Determine the maximum bending moment for the pier if the height of the pier is 10 m. 14

Module -5

19 a) A three hinged parabolic arch hinged at the supports and at the crown has a span of 18 m and a central rise of 4 m. It carries a concentrated load of 10 kN at 4 m from the left support and a udl of 10 kN/m over the left half. Determine the support reaction, normal thrust and radial shear at 5 m from the left support. 14

20 a) A simply supported beam has a span of 15m. UDL of intensity 30kN/m and 6m long crosses the girder from left to right. Draw ILD for SF and BM at a section 8m from left end. Calculate the maximum positive shear force, maximum negative shear force, and maximum bending moment at this section. Determine the absolute maximum BM anywhere in the beam. 14

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