

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S7 (Special Examinations) (FT/S5PT) January 2026 (2015 Scheme)

Course Code: CE403**Course Name: STRUCTURAL ANALYSIS - III**

Max. Marks: 100

Duration: 3 Hours

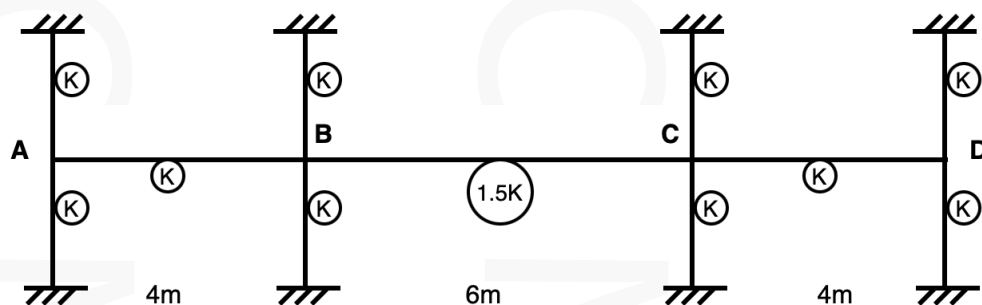
PART A*Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) Analyse the frame using portal method and draw the bending moment and shear force diagram. (15)

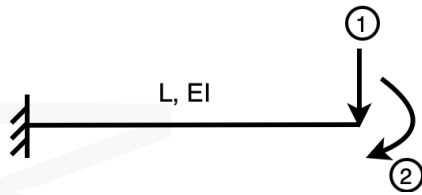


- 2 a) Explain the basic assumptions used in substitute frame analysis. (3)
- b) Find the maximum negative bending moment at A & B in the substitute frame (12)
- shown below applying the corresponding load case. The DL on all spans including self-weight may be taken as 8kN/m and Live Load as 10kN/m. The relative stiffness of the members are given in terms of K.



- 3 a) Identify the types of structures and loading conditions for which the Cantilever Method is most suitable. Also list the assumptions made in cantilever method of analysis. (6)

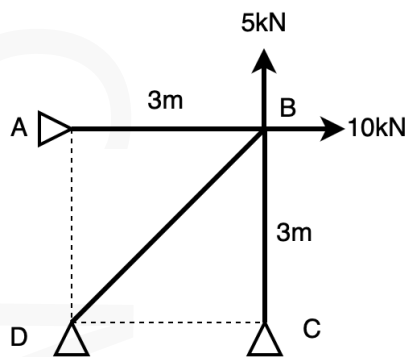
- b) Develop the flexibility matrix for the cantilever beam shown below using the physical approach. (9)



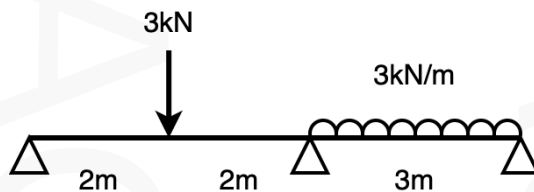
PART B

Answer any two full questions, each carries 15 marks.

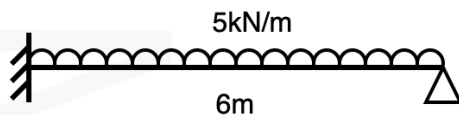
- 4 a) Analyse the truss shown in figure using flexibility method, element approach and find the forces in the members. AE is constant for all members. (15)



- 5 a) Describe the force transformation matrix and its use in structural analysis. (3)
 b) Analyse the beam shown below using the flexibility method, element approach and draw the bending moment diagram. (12)



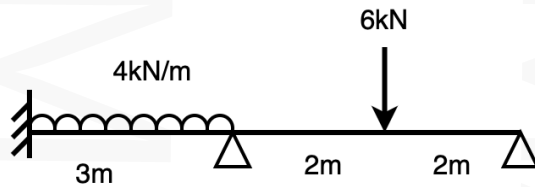
- 6 a) Prove that Stiffness matrix and Flexibility matrix are inverse of each other. (5)
 b) Analyse the beam shown in figure using stiffness method, element approach and draw the bending moment diagram. (10)



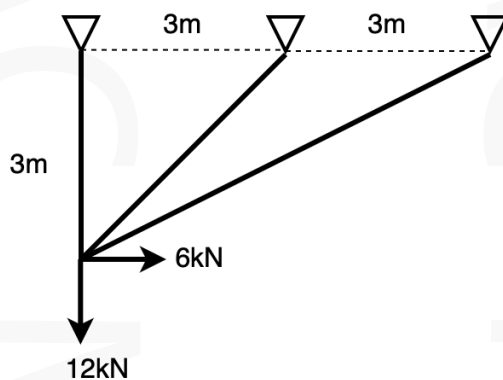
PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Derive the equation of motion for a freely vibrating single degree of freedom (SDOF) system with damping. (5)
- b) Analyse the beam shown below using direct stiffness method and draw the bending moment diagram. (15)



- 8 a) Analyse the truss shown in figure using direct stiffness method and find the forces in the members. (20)



- 9 a) Define logarithmic decrement and derive the equation to represent it. (6)
- b) A single-degree-of-freedom (SDOF) system consists of a mass of 500 kg, a spring with a stiffness of 200 kN/m, and a viscous damper. The system is subjected to a free vibration test, and the displacement amplitudes of two consecutive cycles are measured as follows: At cycle n , the displacement amplitude is 25 mm and at cycle $n+1$, the displacement amplitude is 20 mm. Calculate the logarithmic decrement of the system. Determine the damping ratio of the system. Find the damped natural frequency in Hz, given that the damping is under-damped. If the system is excited by an initial displacement of 30 mm and released, estimate the displacement amplitude after 5 cycles. (14)
