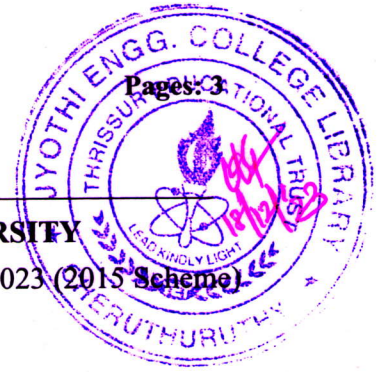Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
B.Tech Degree S7 (S, FE) / S5 (PT) (S, FE) Examination December 2023 (2015 Scheme)

Course Code: CE403
Course Name: STRUCTURL ANALYSIS - III

Max. Marks: 100   Duration: 3 Hours

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

1 a) What are the live load positions for maximum positive and negative moments in   (3)
        beams for the vertical load analysis using substitute frame method.

   b) Analyse the frame shown in figure.1 using cantilever method. Assume same cross   (12)
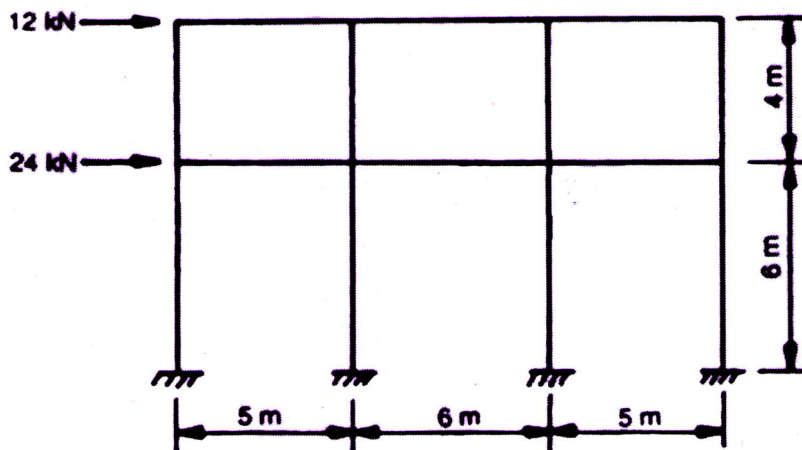   sectional areas for all the columns

Figure.1

2 a) Derive the flexibility and stiffness matrix for the element shown in Figure 2   (6)
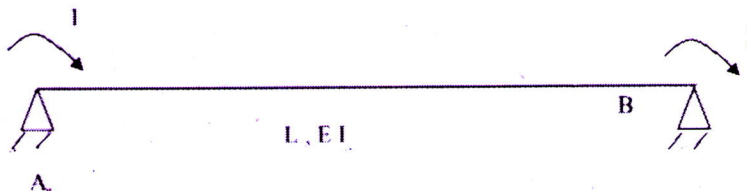

Figure.2

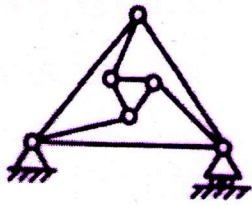   b) Calculate the static and kinematic indeterminacy of the following structures   (9)
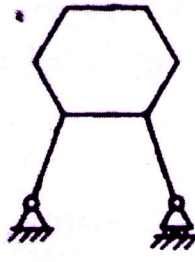
Figure 3   Figure.4   Figure.5
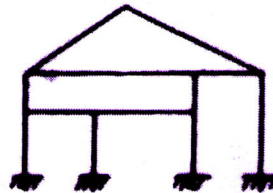
3 a) Define flexibility and stiffness. What is meant by elemental approach and   (5)
       structure approach

   b) Derive the relationship between flexibility and stiffness matrix   (5)

   c) What are the differences between force and displacement method of analysis   (5)

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

4 a) Discuss steps in flexibility method of analysis in a truss   (3)

   b) Analyse the frame shown in figure.6 using flexibility method and draw bending (12)
       moment diagram
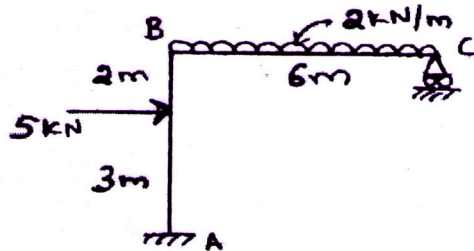

Figure.6

5 a) What is meant local and global coordinates   (3)

   b) Calculate the member forces in the truss shown in Figure.7 using stiffness   (12)
       method.

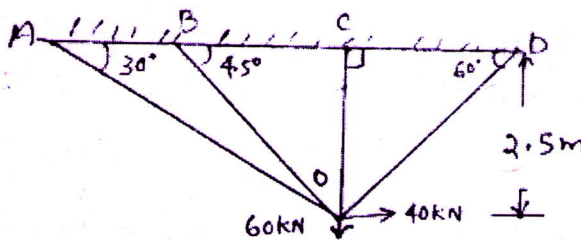Figure.7

6 a) Discuss the need of force transformation matrix and displacement transformation   (5)
        matrix

   b) Define equilibrium and compatibility   (2)

   c) What is meant by equivalent joint loads? Form the equivalent joint load diagram   (8)
        for the frame shown in figure.6.

PART C
Answer any two full questions, each carries 20 marks.

7 a) What are the advantages of direct stiffness method   (5)

   b) Analyse the beam shown in figure.8 using direct stiffness method and draw the   (15)
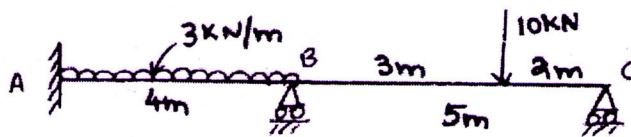   bending moment diagram

Figure.8

8 a) Write the dynamic equation for free vibration and force vibration for undamped   (4)
        and damped single degree of freedom system.

   b) Derive the response of SDOF system subjects to damped free vibration   (12)

   c) Draw the displacement time graph for overdamped and underdamped free   (4)
        vibration

9 a) Compute the natural frequency of the simply supported beam with central load   (8)
        as shown in figure.9.Given spring stiffness=15kN/m and E of beam =3×10^4
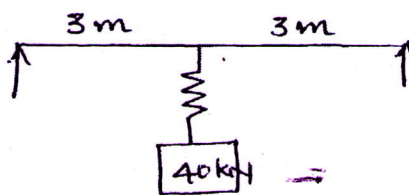   N/mm^2

Figure.9

   b) A vibrating system consists of a mass of 5 kg, spring of stiffness 120 N/m and a   (12)
        damper with a damping coefficient of 5 Ns/m. Determine:

        (i) Damping factor (ii) Natural frequency of damped vibration (iii) Logarithmic
        decrement (iv) The number of cycles after which the initial amplitude is reduced
        to25%

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