Reg No.:_____ Name:_____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree Regular and Supplementary Examination December 2021 (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 is substitute frame? Explain with loading diagram how to find maximum bending moment in beam and column using substitute frame method. (5)

b) Analyse the frame shown in Figure 1 using portal method and find the axial force in columns, shear force in beams and columns, bending moments in beams and columns. Draw the BMD of beams and columns. (10)

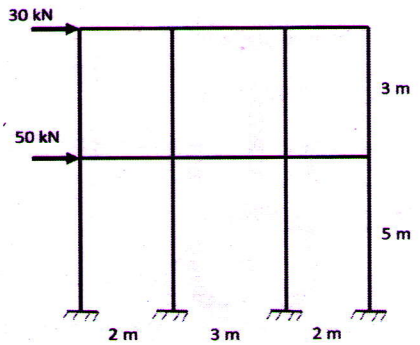

Figure 1

2 a) Define influence coefficients in matrix analysis of structure. (5)

b) Derive the flexibility matrix for the structure with coordinates shown in Figure 2 (5)

Figure 2

c) Derive the formula to find out kinematic indeterminacy of rigid jointed plane frame (5)

3 a) Find the static and kinematic indeterminacy of axially rigid beam (Figure 3), pin jointed frame (Figure 4) and rigid jointed frame (Figure 5) (9)

Figure 3

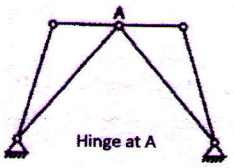

Figure 4

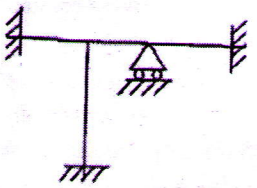

Figure 5

b) Determine the equivalent joint load for the frame loaded as shown in Figure 6 (6)

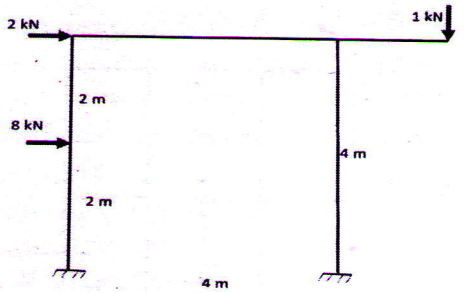

Figure 6

PART B

Answer any two full questions, each carries 15 marks.

4 a) Find the member forces in truss shown in Figure 7 by flexibility matrix method (10)

Take $\frac{AE}{l} = 1$ for all members.

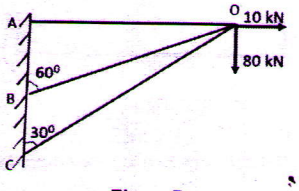

Figure 7

b) Discuss the development of total flexibility matrix of the structure. (5)

5 a) Analyse the frame shown in Figure 8 by stiffness matrix method. Moment of inertia for all members are I (15)

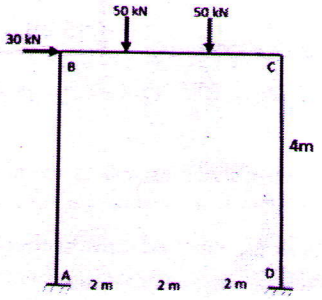

Figure 8

6 a) What is lack of fit? Explain how member forces due to lack of fit is estimated in stiffness method. (6)

b) Explain the importance of transformation matrices in matrix analysis of structures. Establish relationship between force and displacement transformation matrix (5)

c) Generate displacement transformation matrix for the portal frame shown in Figure 9 for the system coordinates and element coordinates given below. (4)

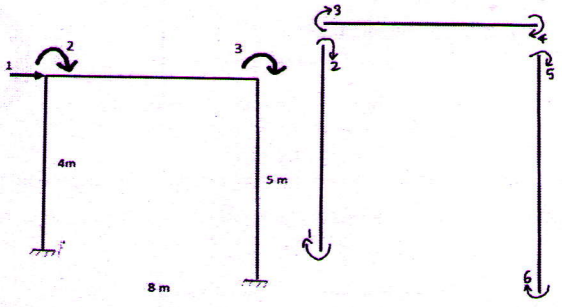

Figure 9

PART C

Answer any two full questions, each carries 20 marks.

7 a) Why it is necessary to transform the element stiffness matrix into global (5)

coordinates?

b) Analyse the structure shown in Figure 10 by direct stiffness method. Assume constant EI for all the members. (15)

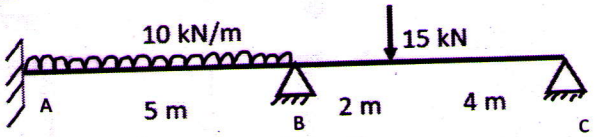

Figure 10

8 a) State and explain D'Alembert's principle and its use in dynamic analysis of systems (5)

b) Explain the term logarithmic decrement and derive its expression. (7)

c) Explain resonance and dynamic magnification factor. (8)

9 a) A mass of 3 kg is suspended from a light spring of stiffness 250 N/m, which is suspended at the free end of a cantilever beam of length 1 m and flexural rigidity 250 Nm^2. Find the natural frequency and form the equation of motion for the system neglecting the mass of the beam and damping. (10)

b) An undamped system vibrates with a frequency of 10 Hz and amplitude 1 mm. Calculate the maximum amplitude of the system's velocity and acceleration. (5)

c) For damping ratio 0.2, Find (5)

i. The damped and undamped frequency

ii. The logarithmic decrement

iii. The ratio of successive amplitude

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