Reg. No.															

Question Paper Code	13321

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Fifth Semester

Civil Engineering

20CEPC504 - STRUCTURAL ANALYSIS I

Regulations - 2020

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	What is static indeterminacy? (a) Number of unknown reactions (b) Number of external reactions minus number of equilibrium equations (c) Number of redundants (d) Number of equilibrium conditions	1	K1	CO1
2.	Kinematic indeterminacy is defined as the number of (a) independent displacement components (b) unknown support reactions (c) equilibrium equations (d) redundant forces	1	K1	CO1
3.	For a continuous beam with 3 spans and simple supports, what is the static indeterminacy? (a) 2 (b) 1 (c) 3 (d) 0	1	K1	CO1
4.	The slope deflection equations relate moments at the ends of members to: (a) Forces and displacements (b) Slopes and deflections (c) Axial loads (d) None of the above	1	K2	CO2
5.	For a beam in equilibrium, the sum of moments about any point is: (a) Zero (b) Equal to the applied load (c) Equal to the support reactions (d) None of the above	1	K1	CO2
6.	The fixed end moment for a beam with a uniformly distributed load w per unit length is: (a) $wl^2 / 8$ (b) $wl^2 / 12$ (c) $wl^2 / 16$ (d) $wl^2 / 24$	1	K2	CO2
7.	What is the stiffness factor for a prismatic beam fixed at both ends? (a) 2EI/L (b) 3EI/L (c) 4EI/L (d) 6EI/L	1	K1	CO3
8.	What is the carryover factor for a member fixed at one end and simply supported at the other end? (a) 0 (b) 0.5 (c) 1.0 (d) 2.0	1	K1	CO3
9.	What does the distribution factor depend on? (a) The material of the beam. (b) The moment of inertia and the span of the beam. (c) Only the span of the beam. (d) Only the moment of inertia.	1	K2	CO3
10.	In the moment distribution method, support settlements are accounted for by: (a) Increasing the stiffness of the members (b) Introducing fixed-end moments due to settlement (c) Reducing the span length (d) Ignoring the settlement effects	1	K1	CO4
11.	In the slope-deflection method, support settlements are accounted for by introducing: (a) Additional moments (b) Displacement terms in the slope-deflection equation (c)Rotation terms only (d) Extra loads at supports	1	K1	CO4
12.	For a symmetric frame with skew-symmetric loading, the moments at mid-span are: (a) Zero (b) Maximum (c) qual to the moments at supports (d) Twice the moments at supports	1	K2	CO4

13.	What is the primary purpose of a flexibility matrix in structural analysis? (a) To evaluate structural strength (b) To assess the adaptability of structures to various loads (c) To calculate material costs (d) To determine aesthetic design	*1*	*K1*	*CO5*
14.	Which of the following is NOT a component of a flexibility matrix? (a) Structural element identification (b) Construction timeline (c) Load application points (d) Support conditions	*1*	*K2*	*CO5*
15.	What type of analysis is typically used to create a flexibility matrix? (a) Static analysis (b) Dynamic analysis (c) Thermal analysis (d) Fluid dynamics	*1*	*K1*	*CO5*
16.	Which analysis method helps assess the dynamic response of structures? (a) Static load analysis (b) Modal analysis (c) Thermal analysis (d) Linear analysis	*1*	*K2*	*CO5*
17.	What does the stiffness matrix represent in structural analysis? (a) Relationship between forces and displacements (b) Stress distribution (c) Load capacity (d) Safety factor	*1*	*K1*	*CO6*
18.	For a truss element, how many degrees of freedom are associated with each node? (a) 1 (b) 2 (c) 3 (d) 4	*1*	*K2*	*CO6*
19.	What is the typical size of the global stiffness matrix for a structure with 4 nodes, each having 2 degrees of freedom? (a) 4 x 4 (b) 8 x 8 (c) 6 x 6 (d) 10 x 10	*1*	*K2*	*CO6*
20.	For a spring element, the stiffness matrix is a: (a) 1 x 1 matrix (b) 2 x 2 matrix (c) 3 x 3 matrix (d) 4 x 4 matrix	*1*	*K1*	*CO6*

PART - B (10 × 2 = 20 Marks)

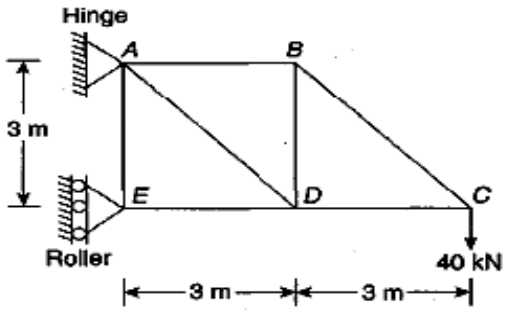
Answer ALL Questions

21.	Briefly explain Statically Indeterminate Structure and Static indeterminacy.	*2*	*K2*	*CO1*
22.	Mathematically represent Degree of Indeterminacy and determine the Degree of Indeterminacy for a fixed beam?	*2*	*K2*	*CO1*
23.	What is slope deflection method?	*2*	*K1*	*CO2*
24.	What is meant by fixed end moment?	*2*	*K1*	*CO2*
25.	What is meant by moment distribution?	*2*	*K1*	*CO3*
26.	What is the use of distribution factors?	*2*	*K1*	*CO3*
27.	Explain how support settlement is accounted for in the Moment Distribution Method.	*2*	*K2*	*CO4*
28.	Explain the effect of support settlement on the carry-over moments in the Moment Distribution Method.	*2*	*K1*	*CO4*
29.	What is meant by indeterminate structures?	*2*	*K1*	*CO5*
30.	Define Degree of Freedom and explain its types.	*2*	*K1*	*CO6*

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

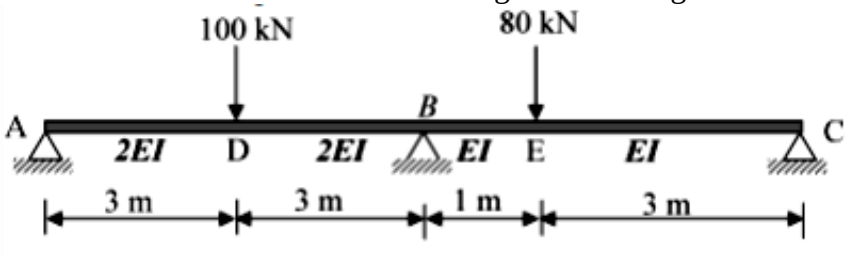
31.	a)	Analyze a two span continuous beam ABC with all the three supports are simply supported. AB = BC = 10 m. It is loaded with UDL of 5kN/m throughout the beam. Use strain Energy method. EI is constant.	*10*	*K3*	*CO1*
		OR			
	b)	Determine the vertical displacement of joint A of the truss given in figure. The member BD is subjected to an increase in temperature of 80^oC. Take the coefficient of thermal expansion as $0.00012/^oC$ and $E=2x10^5$ N/mm^2. The cross-sectional area of each memberis1700 mm^2.	*10*	*K3*	*CO1*



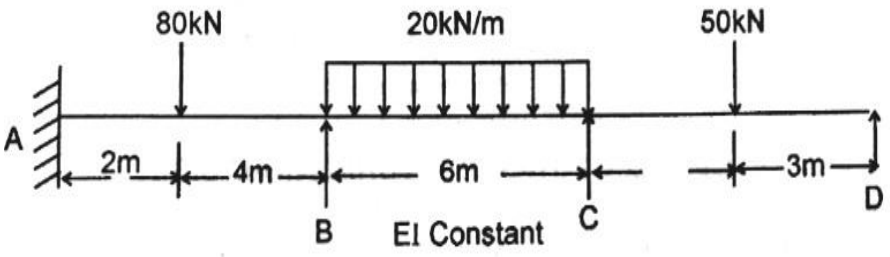
32. a) A continuous beam ABC consists of spans AB and BC of 5 m length in each. Both the ends of the beam are fixed. The span AB carries a point load of 15 kN at its middle point. The span BC carries a point load of 25 kN at its middle point. Find the moments and reactions at the supports. Assume the beam is of uniform section. Use Slope deflection method. *10 K2 CO2*

OR

b) Analyze the continuous beam and draw Bending moment diagram. *10 K2 CO2*



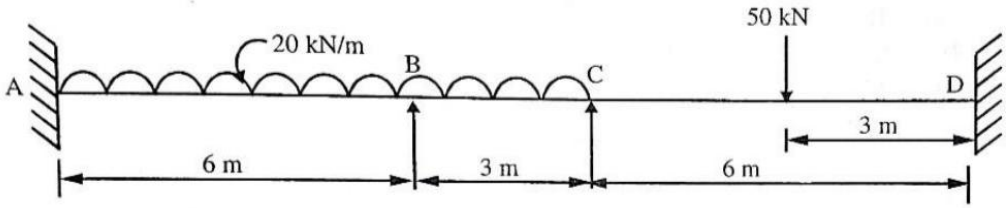
33. a) Analyse the continuous beam loaded as shown in Fig. by the method of moment distribution. *10 K3 CO3*



OR

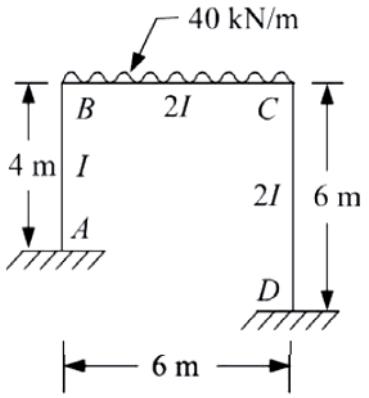
b) A continuous beam ABC is simply supported at A, fixed at C and continuous over support B. The span AB is 6 m and carries a concentrated load of 60 kN at its mid-span and the span BC is 8 m and carries a uniformly-distributed load of 10 kN/m. Take the flexural rigidity for portion AB as 2EI and that for portion BC as EI. Analyze the beam by moment distribution method and draw the shearing force and bending moment diagrams. *10 K3 CO3*

34. a) Analyse the continuous beam ABCD by slope deflection method and find the end moments. Support B sinks by 10 mm. E = 2 x 105 N/mm2 and I = 16 x 10^7 mm4 by slope deflection method *10 K3 CO4*

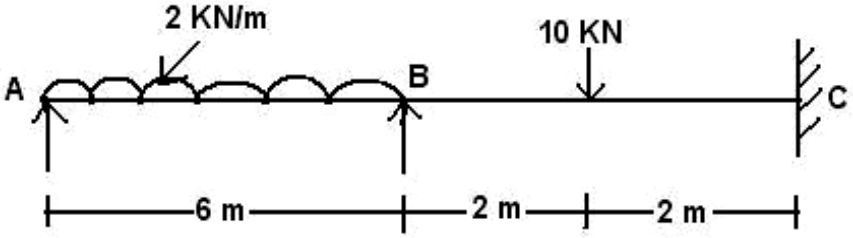


OR

b) Analyse the portal frame shown in fig by the slope deflection method and draw BMD *10 K3 CO4*



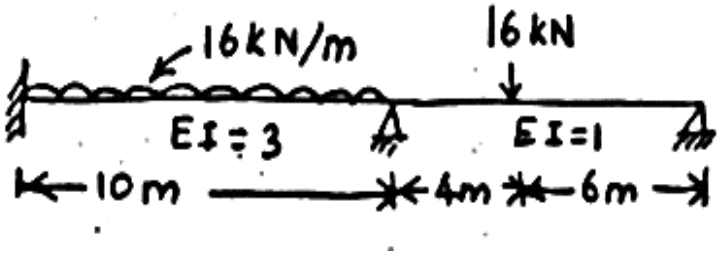
35. a) Analyse the continuous beam ABC shown in figure by flexibility matrix method and sketch the bending moment diagram. *10 K3 CO5*



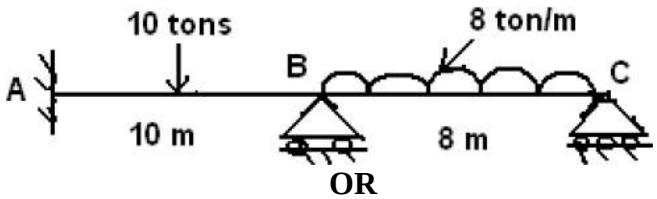
EI = Constant

OR

b) Analyse the continuous beam in fig, by flexibility method. *10 K3 CO5*



36. a) A two span continuous beam ABC is fixed at A and simply supported over the supports B and C. AB = 10 m and BC = 8 m. Moment of inertia is constant throughout. A single central concentrated load of 10 Tons acts on AB and a uniformly distributed load of 8 Ton/m acts over BC. Analyse the beam by stiffness matrix method. *10 K3 CO6*



OR

b) A portal frame ABCD with supports A and D are fixed at same level carries a uniformly distributed load of 2 tons/m on the span BC. Span AB = BC = CD = 4 m. EI is constant throughout. Analyse the frame by stiffness matrix method. *10 K3 CO6*