Reg. No.															

Question Paper Code	14018

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Fifth Semester

Civil Engineering

20CEPC504 – STRUCTURAL ANALYSIS I

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	A continuous beam fixed at one end and simply supported at the other is statically indeterminate to a) 0 degree b) 1 degree c) 2 degrees d) 3 degrees	1	K2	CO1
2.	In a plane truss, the strain energy in a member is given by a) $F^2L/2AE$ b) $FL^2/2AE$ c) $F^2/2AEL$ d) $F\varepsilon/2$	1	K2	CO1
3.	The slope-deflection method enforces equilibrium by ensuring a) Sum of moments at each joint = 0 b) Sum of rotations = 0 c) Sum of loads = 0 d) All supports have zero displacement	1	K1	CO2
4.	In a continuous beam, if one support settles downward by Δ, the moment at the adjacent fixed support (A) is a) $+6EI\Delta/L^2$ b) $-6EI\Delta/L^2$ c) $+3EI\Delta/L^2$ d) $-3EI\Delta/L^2$	1	K2	CO2
5.	The moment distribution method was developed by a)Castigliano b) Hardy Cross c) Clapeyron d) Maxwell	1	K1	CO3
6.	For a symmetric portal frame with symmetric loading, horizontal sway a) Will occur b) Will not occur c) Depends on stiffness ratio d) Cannot be determined	1	K2	CO3
7.	In the flexibility method, the unknowns are a) Displacements at joints b) Redundant forces or moments c) Stiffness coefficients d) Load factors	1	K1	CO4
8.	The flexibility approach is more suitable for a) Highly indeterminate structures b) Structures with low degree of indeterminacy c) All structures equally d) Determinate structures only	1	K1	CO4
9.	The size of the global stiffness matrix depends on: a) Number of members b) Number of elements c) Total number of degrees of freedom (DOF) in the structure d) Number of joints	1	K1	CO5
10.	The relationship between stiffness and flexibility matrices is: a) $[K]=[F]^T$ b) $[K]=[F]^{-1}$ c) $[K]=[F]$ d) $[K]=2[F]$	1	K2	CO5

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

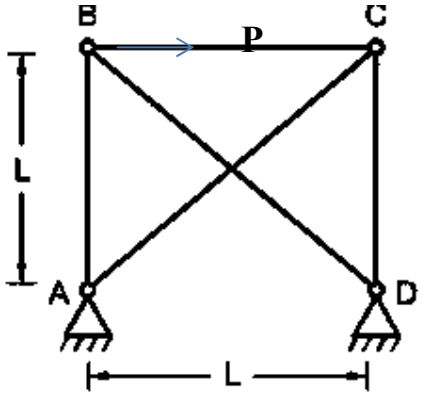
		Marks	K – Level	CO
11.	Differentiate determinate and indeterminate structure.	2	K2	CO1
12.	Define strain energy.	2	K1	CO1
13.	What are the assumptions made in slope deflection method?	2	K1	CO2

14.	Give the expression of slope deflection equation for the fixed beam subjected to udl of intensity 'w' per meter run.	2	K1	CO2
15.	What is distribution factor?	2	K1	CO3
16.	What is carry over moment?	2	K1	CO3
17.	Define a primary structure.	2	K1	CO4
18.	What are compatibility conditions?	2	K1	CO4
19.	Write the stiffness matrix of a typical pin-jointed two-dimensional frame element.	2	K1	CO5
20.	What is transformation matrix?	2	K1	CO5
21.	Give the reasons for side sway.	2	K1	CO3
22.	How many slope deflection equations are available for a two span continuous beam?	2	K2	CO2

PART - C (6 × 11 = 66 Marks)

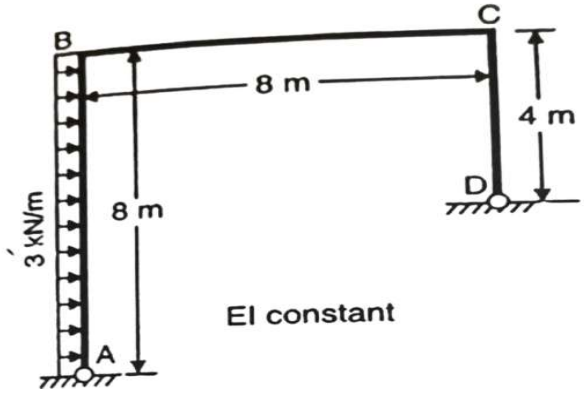
Answer ALL Questions

23.	a)	Determine the forces in the members of truss having L=3.6m and P=40kN. AE is constant for all members.	11	K3	CO1



OR

	b)	A portal frame ABCD has ends A and D hinged and carries UDL 3kN/m on AB. Analyze the frame for the loading as shown using strain energy method.	11	K3	CO1



24.	a)	A continuous beam ABC consist of span AB=5m and BC=4m, the ends A and C being fixed. AB and BC carry uniformly distributed loads of intensity 4kN/m and 5kN/m respectively. The beam is of uniform section throughout the span. Analyze the beam using slope deflection method.	11	K3	CO2

OR

b) A portal frame ABCD with A and D are fixed at same level. Span BC carries a uniformly distributed load of20kN/m. EI is constant. Take Span AB=BC=CD=5m. Analyze the frame using slope deflection method. *11* *K3* *CO2*

25. a) A continuous beam ABCD consists of three spans with fixed supports on both ends and simple supports at B and C. Span AB = 7 m, BC = 6 m, and CD = 6 m. An uniformly distributed load of 3 kN/m acts on AB. A point load of 6 kN acts at 3 m from B. A point load of 9 kN acts at the mid span of CD. Flexural rigidities are I, 2I and I for AB, BC and CD respectively. Determine the bending moments at the supports using Moment distribution method *11* *K3* *CO3*

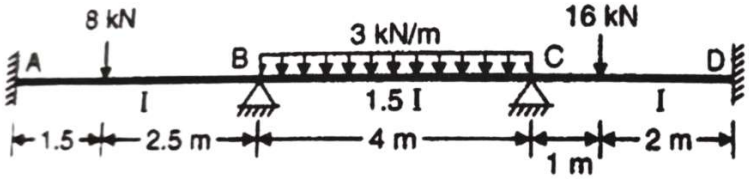
OR

b) A portal frame ABCD with supports A and D are fixed at same level carries a uniformly distributed load of 80kN/m over the span BC. Span AB=BC=CD=9m. EI is constant throughout. Determine the bending moment using moment distribution method. *11* *K3* *CO3*

26. a) A continuous beam ABC 24m long is fixed at A, simply supported at B and C.The intermediate support B is 12m from A and sinks by 30mm. The span AB carries a uniformly distributed load of 3kN/m and the span BC is subjected to a point load of 20kN at 8m from C. Find the bending moment by moment distribution method. Take the flexural rigidity EI as 40,000kNm^2 and is constant throughout the beam. *11* *K3* *CO4*

OR

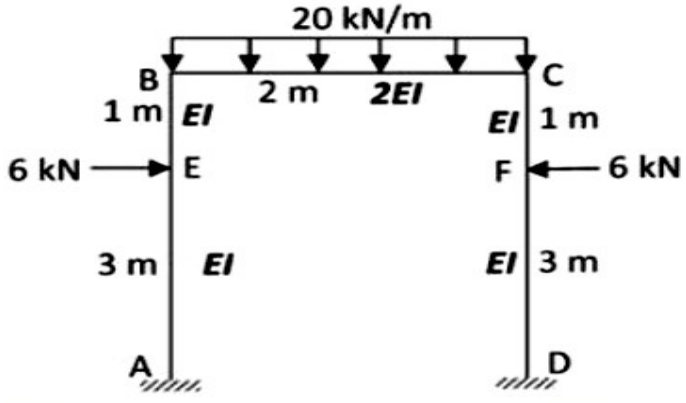
b) Analyze the continuous beam ABCD by slope deflection method and find the end moments. Support B sinks by 10 mm. E = 2 x 105 N/mm^2 and I = 16 x 10^7 mm4 *11* *K3* *CO4*



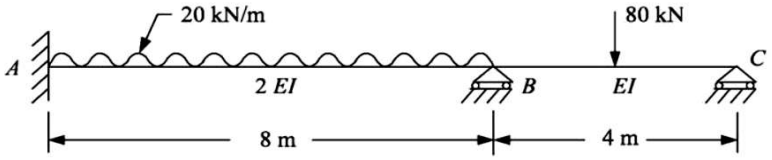
27. a) A continuous beam ABC is fixed at A and C. The span AB=8m carries a single concentrated load of 6.4kN at 5m from support A and BC=6m carries a concentrated load of 8kN at mid span. Moment of inertia is constant throughout the beam. Compute the bending moment using stiffness matrix method. *11* *K3* *CO5*

OR

b) Analyse the portal frame ABCD shown in figure by flexibility matrix method and sketch the bending moment diagram *11* *K3* *CO5*



28. a) Analyse the continuous beam ABC shown in figure by stiffness matrix method and sketch the bending moment diagram. *11 K3 CO3*



OR

b) Analyse the continuous beam ABC shown in figure using stiffness matrix method Assume EI constant *11 K3 CO3*