Reg. No.															

B.Tech. DEGREE EXAMINATION, DECEMBER 2023

Fourth Semester

18CEC205T – STRUCTURAL ANALYSIS

(For the candidates admitted during the academic year 2020-2021 to 2021-2022)

Note:

(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

(ii) **Part - B & Part - C** should be answered in answer booklet.

Time: 3 hours | Max. Marks: 100

PART – A (20 × 1 = 20 Marks)

Answer **ALL** Questions

	Marks	BL	CO	PO

1. Which of the following statements is untrue? | 1 | 1 | 5 | 1,2

(A) Without using Muller Breslau's principle it cannot draw ILD

(B) Muller Breslau's principle is useful for drawing ILD

(C) ILD diagrams of determinate trusses are linear

(D) ILD ordinate for support vertical reaction when the unit load is at the mid span of a cantilever beam is 1.0 m

2. Three loads of equal magnitudes and equal distances between them traverse on simply supported beam. The point of absolute maximum bending moment occurs | 2 | 1 | 5 | 1,2

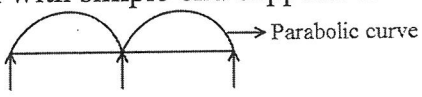
(A) Near the center of the beam below one of the end loads

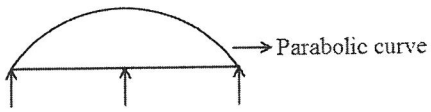
(B) At the center of beam under the middle load

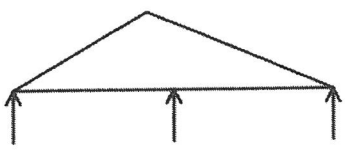
(C) Insufficient information predict

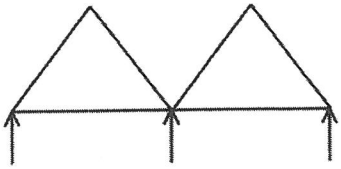
(D) Near the center of the beam under the middle load

3. The qualitative ILD for reaction at mid-support of a two span continuous beam with simple end supports is | 1 | 2 | 5 | 1,2

(A) 

(B) 

(C) 

(D) 

4. A propped cantilever AB has a span of 4m. It has an internal hinge at a distance of 2 m form fixed end A. when a unit load is at 1 m from simply supported end B, the fixed support vertical reaction. | 1 | 2 | 5 | 1,2

(A) 1 kN

(B) 0.5 kN

(C) 0

(D) 2 kN

5. The shape cable take in resisting loads is called a 1 2 6 1,2
   (A) Vermicular curve (B) Funicular curve
   (C) Ventricular curve (D) Curnicular curve

6. A three hinged parabolic arch having a span of 20 m and a rise of 5 m carries a point load of 10 kN at quarter span form left end. Determine the resultant reaction (R) at the left support 1 2 6 1,2
   (A) 9.01 kN (B) 7.65 kN
   (C) 18.15 kN (D) 12.63 kN

7. Degree of static indeterminacy of a three hinged arch 1 1 6 1,2
   (A) 1 (B) 2
   (C) 0 (D) 3

8. A cable resist external load by 1 2 6 1,2
   (A) Axial compression (B) Axial tension
   (C) Bending moment (D) Shear

9. The order of flexibility matrix of a propped cantilever is 1 1 6 1,2
   (A) 2×2 (B) 3×3
   (C) 1×1 (D) 4×4

10. In flexibility matrix method, the unknown are 1 2 4 1,2
   (A) Redundant forces (B) Slopes
   (C) Deflection (D) Settlements

11. Flexibility matrix is always _____. 1 3 4 1,2
   (A) Symmetric (B) Non-symmetric
   (C) Anti-symmetric (D) Depends upon loads applied

12. Numerical accuracy of solution increase if flexibility coefficients with larger values are located 1 1 4 1,2
   (A) Near edges (B) Near main diagonal
   (C) In between (D) Near side middle

13. In moment distribution method, the sum of distribution factors of all the member meeting at any joint is always 1 3 1,2 1,2
   (A) > 1 (B) < 1
   (C) 1 (D) 0

14. Slope deflection method is 1 2 1,2 1,2
   (A) Equilibrium method (B) Deformation method
   (C) Equilibrium, deformation and stiffness (D) Stiffness coefficient method

15. In a member AB, if a moment of –10 kNm is applied at A, what is the moment carried over to B? 1 3 1,2 1,2
   (A) –10 kNm (B) –5 kNm
   (C) +10 kNm (D) +5 kNm

16. A moment distribution table developed for a 3 span continuous beam ABCD indicates that moments are released at the 2 extreme end A and D by application of moments in the opposite direction. This indicates that

1 2 1,2 1,2

(A) Two ends A and D are clamped
(B) There is no load on the end spans
(C) Two ends A and D are simply supports
(D) Ends A and D are continuous

17. The stiffness method is also known as

1 2 3 1,2

(A) Unit load method
(B) Consistent deformation method
(C) Force method
(D) Displacement method

18. Which of the following one is used in computer software?

1 2 3 1,2

(A) Slope deflection method
(B) Flexibility method
(C) Three moment equation
(D) Stiffness method

19. The moments at support of a beam or frame cannot be directly found using

1 1 3 1,2

(A) Element flexibility method
(B) Moment distribution method
(C) Direct stiffness method
(D) Direct flexibility method

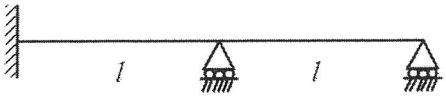
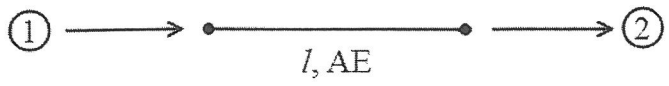
20. Consider the following beam structure. What will be the dimension of the global stiffness matrix without considering the boundary condition

1 2 3 1,2

(A) 4×4
(B) 8×8
(C) 12×12
(D) 24×24

PART – B (5 × 4 = 20 Marks)

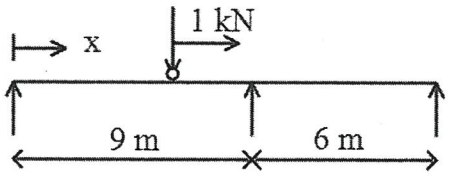
Answer **ANY FIVE** Questions

	Marks	BL	CO	PO
21. Plot influence line diagram for simple support reaction in a propped cantilever beam AB of length 8 m. Find the ordinate at 5 m from the fixed end of the beam.	4	2	1	1
22. State Muller Breslau principle.	4	1	1	1
23. Explain the types of arches with a neat sketch.	4	1	2	1
24. Define stiffness factor and distribution factor.	4	2	2	1
25. Form the system stiffness matrix for the continuous beam shown below, Take EI constant. 	4	1	3	1
26. Generate stiffness matrix of an element shown below. 	4	2	4	1
27. A proper cantilever of span 6 m is given a rotation of 0.02 radians at simply supported end. EI = 30000 kN-m^2. Determine the support end moment at fixed end.	4	3	5	1

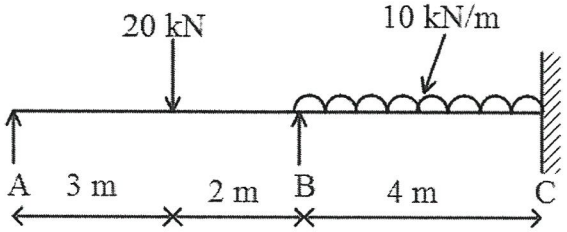
PART – C (5 × 12 = 60 Marks)

Answer **ALL** Questions

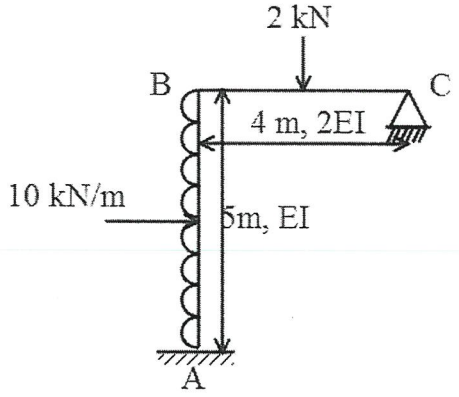
		Marks	BL	CO	PO
28. a.	A simply supported beam has a span of 11 m. Determine (i) Absolute maximum B.M if a udl of intensity 25 kN/m of length 6 m travels over it (ii) Maximum B.M at left quarter span	12	4	5	1,2
	(OR)				
b.	Determine ILD ordinates for a two span continuous beam for the interior support and plot the ordinates at 3 m intervals.	12	3	5	1,2



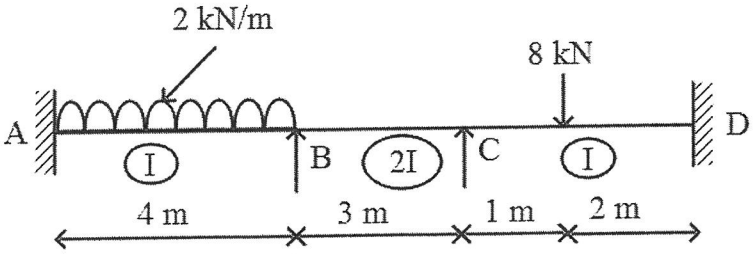
29. a.	A three hinged parabolic arch of span 15 m and central rise 3 m is subjected to udl of 12 kN/m over a length of 4 m from right springing. Calculate the maximum bending moment.	12	4	6	1,2
	(OR)				
b.	A cable supported on towers at same level of 50 m horizontal span and 8 m central dip. Calculate the maximum tension in the cable, if it is carrying a UDL of 15 kN/m. Also calculate the vertical force in the tower when the back stay is inclined at an angle of 30° to the horizontal if (i) The cable passes over a guided pulley (ii) The cable passes over a saddle with rollers	12	4	6	1,2
30. a.	Draw bending moment diagram of a two span continuous beam shown below, using flexibility method.	12	4	4	1,2



	(OR)				
b.	Analyze the frame using flexibility method shown below and plot BMD.	12	4	4	1,2

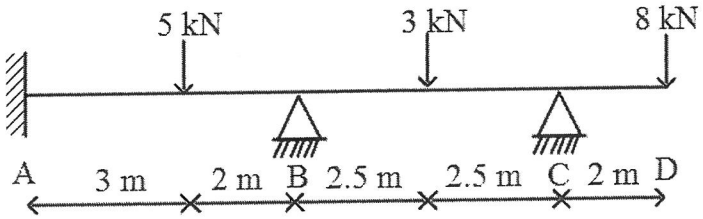


31. a. Draw BMD for the given beam shown below using moment distribution method. 12 4 1,2 1,2

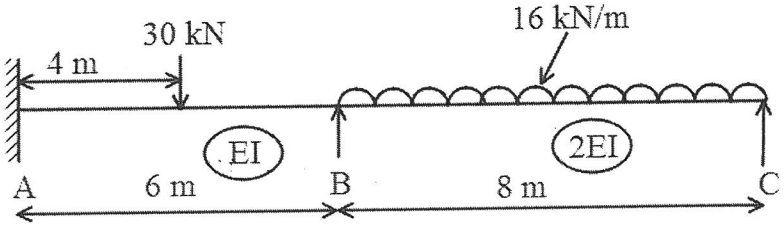


(OR)

b. Using slope deflection equation, compute the end moment for the beam shown below. Assume EI as constant. 12 4 1,2 1,2

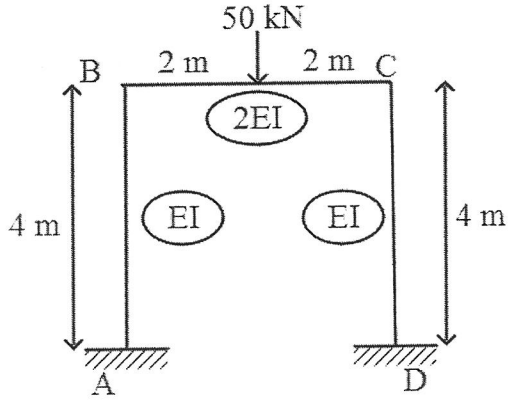


32. a. Determine the support moment M_A using stiffness method for the beam shown below. Draw BMD. 12 4 3 1,2



(OR)

b. Analyze the frame using stiffness matrix method. Determine the rotation at B. 12 4 3 1,2



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