

5E1741

Roll No.

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B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025
Civil Engineering
5CE4-02 Structural Analysis - I

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205).

PART-A

(Answer should be given up to 25 words only)

All questions are compulsory.

(10×2=20)

1. Differentiate Static and Kinematic indeterminacy?
2. Describe the Maxwell's Reciprocal theorem with the statements.
3. Calculate static and kinematic indeterminacy of given Figure?



4. Explain the Distribution factor.
5. Define the D'Alembert's principle.
6. Discuss the releases in structures.
7. Write down the basic elements of vibratory system.
8. Differentiate the damped and forced vibration?
9. Define the term "Angular oscillation".
10. List the characteristics of simple harmonic motion.

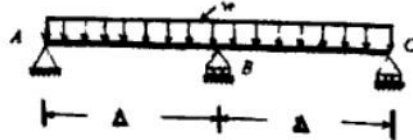
PART - B

(Analytical / Problem Solving Questions)

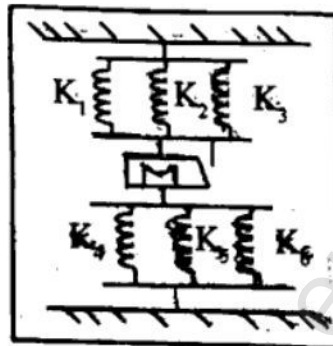
Attempt any Five questions.

(5×4=20)

1. Determine the support reactions of the continuous beam ABC as shown in Fig. 2 using area moment method?



2. Derive the equation of "addition of harmonic motion".
3. Calculate the equivalent stiffness of spring mass system shown in fig. given below. Also find out the mass supported by the spring. When the system has natural frequency of vibration is 1 Hz, where spring constant $K_1 = K_6 = 1000 \text{ N/m}$, $K_2 = K_3 = 2000 \text{ N/m}$, $K_4 = 1500 \text{ N/m}$ and $K_5 = 500 \text{ N/m}$.



4. Define the stiffness of springs for series and parallel connections.
5. Derive the differential equation for free vibration of undamped single degree of freedom systems. Also give the solution of the differential equation.
6. Define the characteristics of Simple Harmonic Motion.
7. Describe the Mathematical model vibratory system.

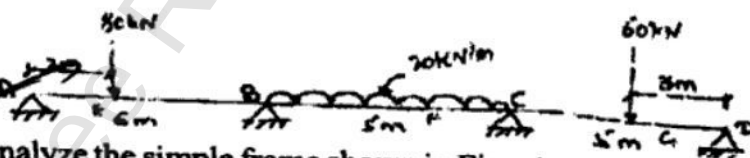
PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions.

(3×10=30)

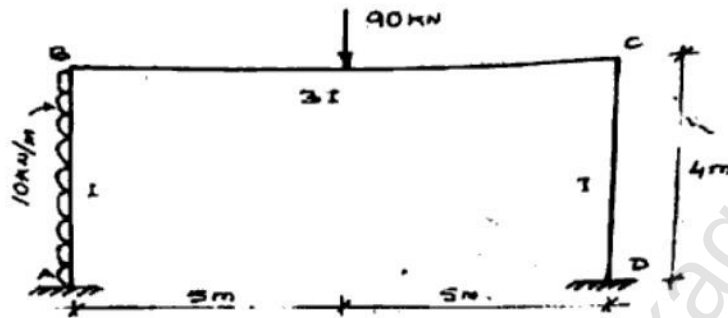
1. Analyse the beam as in Fig. 3 by using three-moment theorem when support B sinks by 5mm and $I = 9300 \text{ cm}^4$; $E = 2.1 \times 10^5 \text{ N/mm}^2$ throughout the span.



2. Analyze the simple frame shown in Fig. given below. Draw the bending moment diagram by using moment distribution method.



3. Analyze the portal frame subjected to loads as shown fig. given below. Draw bending moment diagram and deflected shape by using slope deflection method.



4. Analyze the portal frame subjected to loads as shown in question no. 3. Draw bending moment diagram by using moment distribution method.
5. Analyse the portal frame ABCD given below. Support A and D both are fixed. Span BC is loaded as per given figure. Draw the BM diagram by using slope deflection method. Also sketch the deflected shape of the frame.

