



B.E DEGREE EXAMINATIONS: NOV/DEC 2022

(Regulation 2018)

Fifth Semester

CIVIL ENGINEERING

U18CET5103: Structural Analysis

COURSE OUTCOMES

- CO1:** Calculate static and kinematic indeterminacy of structures
CO2: Analyse beams and frames using moment distribution method
CO3: Analyse beams and frames using matrix flexibility method
CO4: Analyse beams and frames using matrix stiffness method
CO5: Use the influence line diagram for analysis of determinate and indeterminate beams
CO6: Analyse arches and suspension cables

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

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|---|-----|-------------------|
| 1. Define static and kinematic indeterminacy. | CO1 | [K ₁] |
| 2. A beam ABC is fixed at A and simply supported at B and C. The length of AB = BC = L. Flexural rigidities of AB and BC are 2EI and EI respectively. Find the distribution factors at joint B. | CO2 | [K ₂] |
| 3. Define carry-over moment. | CO2 | [K ₁] |
| 4. For a fixed beam, which of these two methods best suits the analysis – The force method or the displacement method? Why? | CO3 | [K ₂] |
| 5. A steel rod of length 'l', area of c/s 'A', and young's modulus 'E' is subjected to axial unit load. What is its axial flexibility? | CO4 | [K ₂] |
| 6. What are the situations wherein sway will occur in portal frames? | CO4 | [K ₂] |
| 7. List the uses of influence line diagrams. | CO5 | [K ₁] |
| 8. Draw the influence line diagram for the shear force at point X in a simply supported beam AB of span 'l' m. | CO5 | [K ₂] |
| 9. Compare two hinged and three hinged parabolic arches. | CO6 | [K ₂] |
| 10. List the main functions of stiffening girders in suspension bridges. | CO6 | [K ₁] |

**Answer any FIVE Questions: -
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)**

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|-----|----|---|----|-----|-------------------|
| 11. | a) | Calculate the static and kinematic indeterminacy of the structures shown in Fig.1. | 8 | CO1 | [K ₃] |
| | b) | Compare the following | 8 | CO1 | [K ₂] |
| | | i. Determinate and Indeterminate structures. | | | |
| | | ii. Equilibrium and Compatibility method | | | |
| 12. | | Analyze the beam shown in Fig.2 using the moment distribution method and draw BMD and SFD. | 16 | CO2 | [K ₄] |
| 13. | | Determine the system flexibility matrix for the frame loaded as shown in Fig.3 using the matrix flexibility method. | 16 | CO3 | [K ₃] |
| 14. | | Analyze the continuous beam ABC shown in Fig.4 by matrix stiffness method and draw the bending moment and shear force diagram. | 16 | CO4 | [K ₄] |
| 15. | | Two-point loads of 100 kN and 200 kN spaced 3 m apart cross a girder of span 12 m from left to right with the 100 kN leading. Draw the ILD for shear force and bending moment and find the maximum shear force and bending moment values at a section 4 m from the left-hand support. | 16 | CO5 | [K ₃] |
| 16. | a) | A cable is suspended and loaded as shown in Fig. | 8 | CO6 | [K ₃] |
| | | 1. Compute the length of the Cable | | | |
| | | 2. Compute the horizontal component of tension H in the Cable | | | |
| | | 3. Determine the magnitude and the position of maximum tension in the cable. | | | |
| | b) | A suspension bridge with a three-hinged stiffening girder has a span of 100m, a central dip of cable of 8m, and weighs 2500 kN. It has to carry a live load of 50 kN/m. Calculate the sectional area of cables required and the sectional modulus for each girder if the permissible stress is 120 N/mm ² . The live load may cover all or any part of the span. | 8 | CO6 | [K ₃] |


