Registration No.: | | | | | | | | | | |

Total Number of Pages: 03 **Course: B.Tech**

Sub_Code: RCI5D001

5th Semester Back Examination: 2025-26

SUBJECT: Structural Analysis-II.

BRANCH(S): CIVIL

Time: 3 Hours

Max Marks: 100

Q.Code: U019

Answer Q1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) State the relation between stiffness matrix and flexibility matrix.

b) A continuous beam ABC fixed at ends A and C, hinged at B. Span length of AB is 4 m and BC is 8 m, flexural rigidity of span AB is twice of span BC. Find the rotation factor for members at joint B.

c) Write the slope deflection equation and mention what each term represents.

d) Define kinematic indeterminacy or Degree of Freedom.

e) Define plastic hinge and plastic moment capacity.

f) Estimate the shape factor value for a circular section of diameter 4 m.

g) Define the term plastic modulus.

h) Define the term storey shear.

i) A continuous beam ABC fixed at end C, hinged at A and B. Span length of AB is 5 m and BC is 10 m. Flexural rigidity of span AB is half of span BC. Find the distribution factor for members at joint B.

j) Estimate the horizontal thrust of a two hinged semi-circular arch of radius R = 4 m, subjected to a point load "W = 100 kN" at crown.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

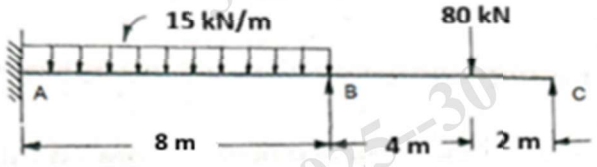
a) A continuous beam ABC consists of spans AB and BC of lengths 12 m and 10 m respectively. The span BC carries a uniformly distributed load of 10 kN/m, while a concentrated load 100 kN acts on center of AB. The end A is fixed and C is simply supported. Find the support moments assuming EI constant for all members. Use slope defection method.

b) A continuous beam ABC consists of spans AB and BC of lengths 10 m and 8 m respectively. The span AB carries a uniformly distributed load of 12 kN/m, while a concentrated load 100 kN acts on center of BC. The ends A and C are simply supported. Using moment distribution method, estimate the support moments assuming flexural rigidity of AB is half of BC.

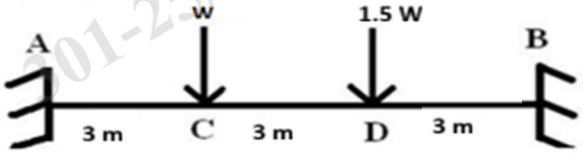
c) A continuous beam ABC consists of spans AB and BC of lengths 6 m and 10 m respectively. The span BC carries a uniformly distributed load of 80 kN/m, while span AB carries a uniformly distributed load of 50 kN/m. The end A is fixed and C is simply supported. Find the support moments taking same flexural rigidity EI for both the spans using Kani's method.

d) Write the equations to analyze a fixed arch by consistent deformation method.

e) Analyze the continuous beam as shown below using stiffness matrix method. EI is same for both the spans AB and BC.

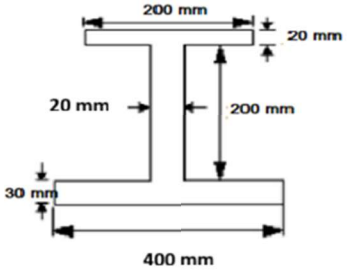


f) Determine the collapse load for the fixed beam shown below having plastic moment capacity 150 kNm.



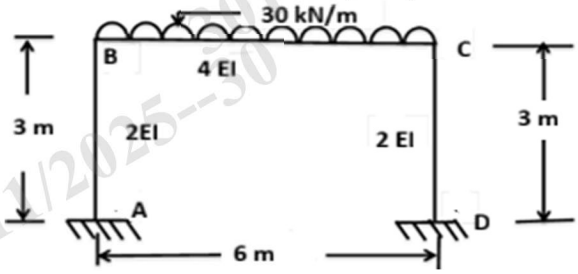
g) Write about Lower bound and upper bound theorem.

h) Estimate the value of shape factor for the "I" section shown below.



i) Derive the sway correction factor for a single bay and single storey frame.

j) Analyze the portal frame by slope deflection method and draw the moment diagram.



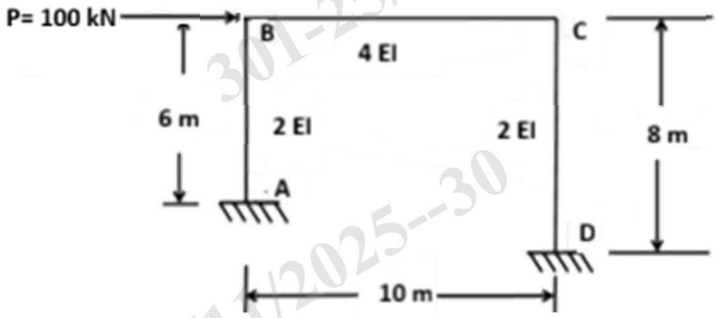
k) A two hinged circular arch of span 20 m and rise 4 m is loaded with a uniformly distributed load of 40 kN/m over the left half span and a concentrated load of 80 kN at the midpoint of the right half of the arch. Calculate the horizontal reaction and normal thrust at a section just to the right of concentrated load.

l) Write a short note on stiffness matrix.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

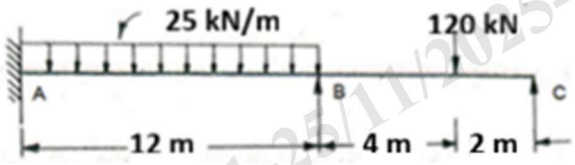
Q3 Analyze the portal frame ABCD shown below subjected to a horizontal force "P" of 100 kN at "B" by moment distribution method. Flexural rigidity of spans AB, BC, and CD are 2 EI, 4 EI, and 2 EI respectively. **(16)**



Q4 A two hinged parabolic arch of span 40 m and rise 6 m carries a uniformly distributed load of 25 kN/m for the left half of the span and a concentrated load of 100 kN at 10 m from right support. Assume $I = I_0 \sec\theta$, I_0 is the moment of inertia at crown and θ is the slope at the section under consideration. Determine the **(16)**

a) Horizontal thrust
b) Maximum positive and negative moment
c) Shear force and normal thrust at 10 m from the left support.

Q5 Analyze the two span continuous beams shown below when support B sinks down by 15 mm and support C sinks down by 5 mm using flexibility matrix method. EI of span AB = EI of span BC = 10.0 MNm^2. **(16)**



Q6 Analyze the portal frame ABCD as shown below. A point load W = 100 kN is acting at point "P" 3.5 m away from joint "B". Flexural rigidity of spans AB, BC, and CD are 2 EI, 8 EI, and 2 EI respectively. Solve the problem using Kani's method. **(16)**