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

Total Number of Pages: 03 **Course: B.Tech/IDD (B.Tech and M.Tech)**

Sub_Code: RCI5D001

5th Semester Regular/Back Examination: 2024-25

SUBJECT: Structural Analysis-II.

BRANCH(S): C&EE, CIVIL, CE

Time: 3 Hours

Max Marks: 100

Q.Code: R036

Answer Question No.1 (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 difference between force method and displacement method.

b) A continuous beam ACB fixed at end A, hinged C and B. Span length of AC is 4 m and CB is 10 m, flexural rigidity of span AC is same as span BC. Find the distribution factor for members at joint C.

c) Write assumptions made in slope deflection method.

d) What is the degree of static indeterminacy in a two hinged arch and in a fixed arch?

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

f) Find the shape factor for a circular section of diameter 400 mm.

g) A propped cantilever of span L carries a vertical concentrated load at the mid span. If the plastic moment capacity of the section is M_p, estimate the magnitude of the collapse load.

h) Differentiate between rotation factor and distribution factor.

i) Write the equation for displacement factor.

j) Calculate the horizontal thrust for a two hinged semi-circular arch of radius R subjected to point load W at crown.

Part-II

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

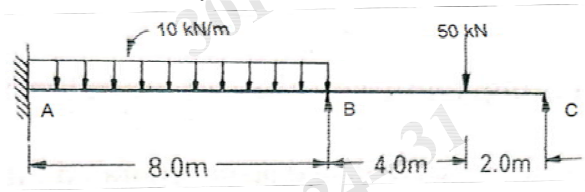
a) A continuous beam ABC consists of spans AB and BC of lengths 8 m and 12 m respectively. The span BC carries a uniformly distributed load of 12 kN/m, while a concentrated load 80 kN acts on centre of AB. The end A is fixed and C is simply supported. Find the support moments assuming EI constant for all members. Use slope defection method.

b) A continuous beam ABC consists of spans AB and BC of lengths 6 m and 8 m respectively. The span AB carries a uniformly distributed load of 10 kN/m, while a concentrated load 60 kN acts on centre of BC. The ends A and C are simply supported. Using moment distribution method, estimate the support moments assuming flexural rigidity of AB is twice of BC.

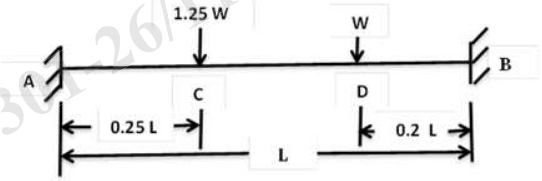
c) A continuous beam ABC consists of spans AB and BC of lengths 5 m and 10 m respectively. The span AB carries a uniformly distributed load of 50 kN/m, while span BC carries a uniformly distributed load of 60 kN/m. The end A is fixed and C is simply supported. Find the support moments taking same flexural rigidity for both the spans using Kani's method.

d) In arches bending moment is found to be less than that of a beam of same length, same loading and same flexural rigidity. Justify this. Draw figures to prove this. Also show different components and reactive forces acting on arches.

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

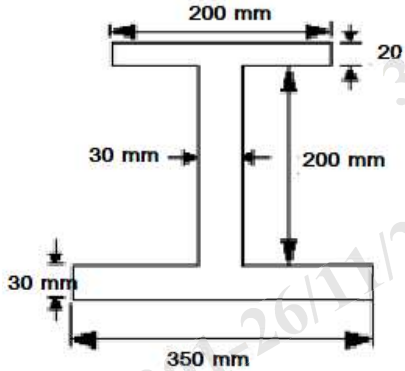


f) Determine the collapse load for the fixed beam shown below having plastic moment capacity M_p.



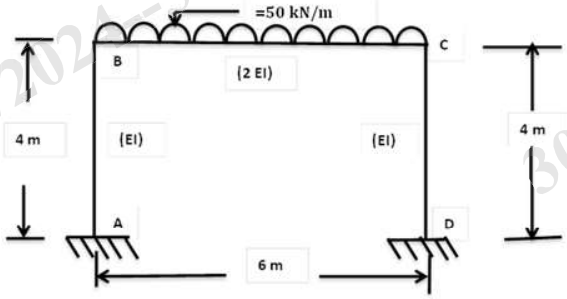
g) State the upper bound and lower bound theorems and write their applications.

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



i) Derive the sway correction factor of a single bay and single story frame.

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



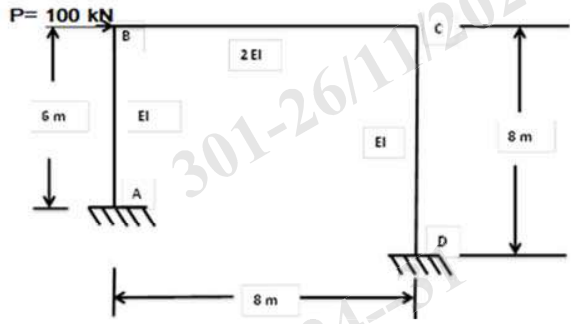
k) A two hinged parabolic arch of span 'L' and rise 'H' carries a uniformly distributed load of 'w' per unit run for a distance 'a' from the left end. Determine the horizontal thrust.

l) Write a short note on stiffness matrix

Part-III

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

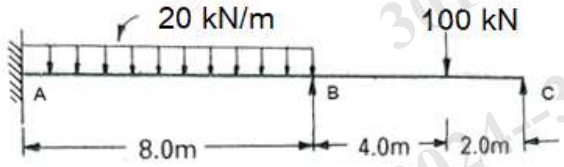
Q3 Analyze the portal frame ABCD shown below subjected to a horizontal force "P" of 100 kN at "B" by moment distribution method. Flexural rigidity of spans AB, BC, and CD are EI, 2EI, and EI respectively. **(16)**



Q4 A two hinged parabolic arch of span 40 m and rise 6 m carries a uniformly distributed load of 35 kN/m for the left half of the span and a concentrated load of 120 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)**

i. horizontal thrust
ii. Maximum positive and negative moment
iii. Shear force and normal thrust at 10m from the left support.

Q5 Analyze the two span continuous beam shown below when support B sinks down by 30 mm and support C sinks down by 10 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 = 80 kN is acting at point "P" 1.5 m away from joint "B". Flexural rigidity of spans AB, BC, and CD are EI, 4EI, and EI respectively. Solve the problem using Kani's method. **(16)**