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

Total Number of Pages: 03

Course: B.Tech/IDD
Sub_Code: CIPC3003

5th Semester Regular Examination: 2025-26
SUBJECT: Advanced Structural Analysis
BRANCH(S): CIVIL, CE
Time: 3 Hours
Max Marks: 100
Q.Code: U276

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III. Assume suitably the missing values.
The figures in the right hand margin indicate marks.

Part-I

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

a) Enumerate different reasons for sway in portal frames.
b) Write the reasons for preferring to Kani's 'Rotation Contribution' method over "Moment distribution method".
c) Explain "relative stiffness".
d) Distinguish between two hinged and three hinged arches?
e) A two hinged semicircular arch of span 20 m is loaded with a concentrated load of 50 kN at the crown. Write the value of horizontal thrust.
f) State Muller Breslau's principle?
g) Differentiate between plastic hinge and mechanical hinge.
h) Define "plastic moment" of a section.
i) Differentiate between local coordinates and global coordinates.
j) The stiffness matrix for an element is given by $\frac{EI}{L}\begin{bmatrix} 4 & 2 \\ 2 & 8 \end{bmatrix}$ what shall be the flexibility matrix for that element, keeping all other conditions similar.

Part-II

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

a) Differentiate between force and displacement methods of structural analysis.
b) Explain the Kani's method for the frames with columns of equal height and subjected to horizontal loads with fixed ends and also hinged ends.
c) Analyze the beam in figure 1 using moment distribution method. Assume E constant.

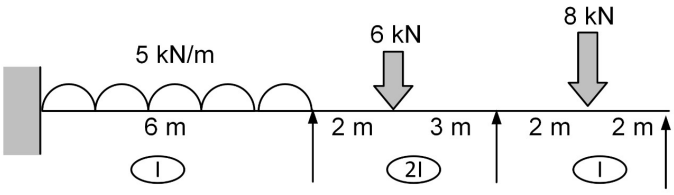

Figure 1

d) A cable ABC of uniform cross section is used to span a distance of 40 m. The cable is subjected to uniformly distributed load of 10 kN/m run. The left support 'A' is below the right support 'B' by 2 m and the lowest point on the cable 'C' is located below left support 'A' by 1 m. Evaluate the reactions and the maximum and minimum values of tension in the cable.

e) With neat sketch list out and explain various features of a suspension bridge.

f) A simply supported beam has a span of 25 m. Draw the influence line diagram for the bending moment and shear force at a section 10 m from the left. Also determine maximum bending moment and shear force at this section due to two point-loads of 10 kN and 5 kN at a fixed distance of 2.5m apart rolling from left to right with 5kN load at leading.

g) Explain: (I) Lower bound theorem, (II) Upper bound theorem and uniqueness theorem.

h) Derive the shape factor for a circular section of 'D' diameter.

i) A beam of uniform section having span "L" and plastic moment M_P is fixed at one end and simply supported at other end, what is the maximum concentrated load W that beam can carry if the load W acts at a distance of L/3 from the fixed end.

j) Develop the flexibility matrix for the cantilever with coordinates as shown in Figure 2.

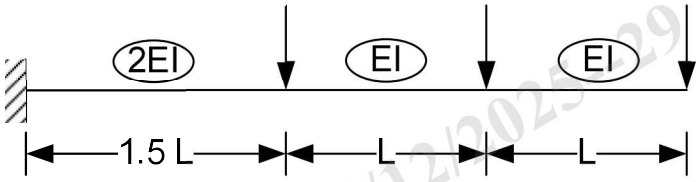

Figure 2

k) Explain properties of stiffness matrix.

l) Explain briefly about "application of stiffness matrix for the analysis of plane truss structure".

Part-III

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

Q3 Analyze the portal frame in Figure 3 using slope deflection method. E constant. **(16)**

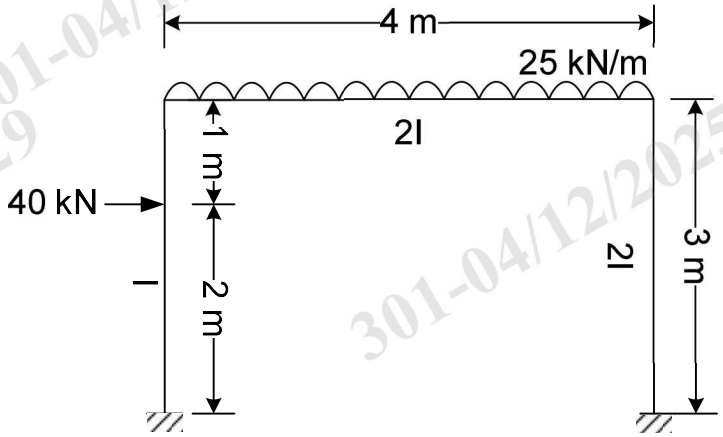

Figure 3

Q4 A two hinged parabolic arch has a varying moment of inertia (I) given by the expression $I = I_o sec\theta$. It has a span 50 m and central rise of 10 m. Calculate the maximum positive and negative bending moment at a section 10 m from left support due to a moving point load of 10 kN. **(16)**

Q5 Find the collapse load for the portal frame shown in Figure 4. All symbols have their usual meaning. **(16)**

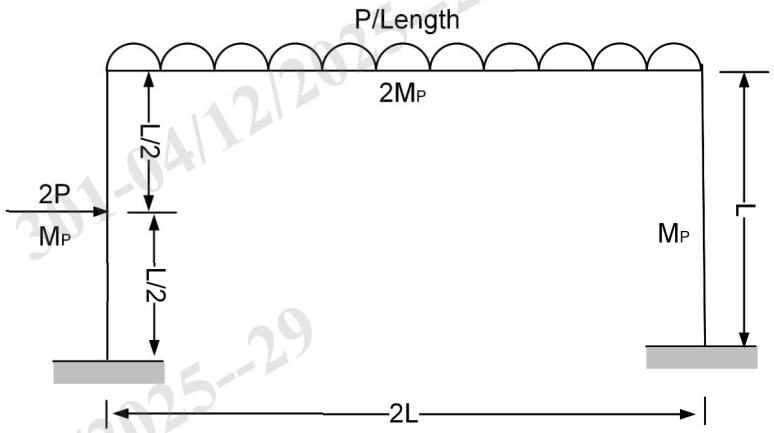

Figure 4

Q6 A continuous beam ABC is fixed at extreme left end (*i.e.* end A) and simply supported at extreme right end (*i.e.* at end C). The span AB is 5 m and BC is 4 m. Span AB is loaded with a uniformly distributed load of 50 kNm throughout the span and span BC is loaded with a concentrated load of 80 kNm at a distance 2 m from the B support. Calculate end moments by stiffness matrix method and draw bending moment diagram. Assume EI constant. **(16)**