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

Total Number of Pages: 02 **Course: B.Tech**
Sub_Code: RCI4C003

4th Semester Regular/Back Examination: 2023-24
SUBJECT: Structural Analysis-I
BRANCH(S): C&EE,CIVIL,CE
Time: 3 Hour
Max Marks: 100
Q.Code: P415

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) Determine the degree of kinematic indeterminacy for a beam fixed at one end and hinged at other.
b) Determine the static indeterminacy of beam (AB) fixed at both ends.
c) Define conjugate beam.
d) State two silent features of arches.
e) Mention the advantages of fixed beam.
f) Define Strain energy.
g) State the Maxwell's Theorem of Reciprocal Displacements.
h) Define space truss.
i) Define maximum bending moment envelope.
j) Write two applications of influence line diagram.

Part-II

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

a) Differentiate between force and displacement methods with examples.
b) A cantilever beam AB of span 8m is fixed at A and propped at B. The beam carries a uniformly distributed load of intensity 2 kN/m over its whole span. Determine the reaction at propped end.
c) State and explain Castigliano's theorems.
d) A three hinged circular arch hinged at the springing and crown points has span of 40m and central rise of 8m. It carries a uniformly distributed load 20kN/m over the left half the span. Find the vertical and horizontal reaction at supports.
e) Draw the influence line diagram for horizontal thrust (H) of a three hinged arch of span L and rise h.
f) Draw the influence line diagram for sheer force of a simply supported beam.
g) State and explain theorem of three moments with neat sketch.

h) Determine the deflection at free end (B) of cantilever beam (AB) of span length 10m using Castigliano's theorem. The beam is fixed at (A) and loaded with a uniformly distributed load of intensity 12 kN/m. The young's modulus of elasticity (E) is 200 GPa and moment of inertia is 500 $\times 10^6 mm^4$.

i) Write short note on Virtual work method.

j) A cable loaded with 1kN per horizontal meter run is stretched between two supports at the same levels, 150m apart. If the central dip is 12 m, find the greatest and least tension in the cable.

k) Find the deflection at the free end of cantilever beam of span 10 and carrying a uniformly distributed load of intensity 20 kN/m over the entire span using conjugate beam method

l) Draw the bending moment diagram of a fixed beam of length 6m, carrying a concentrated load of 25 kN at the mid span.

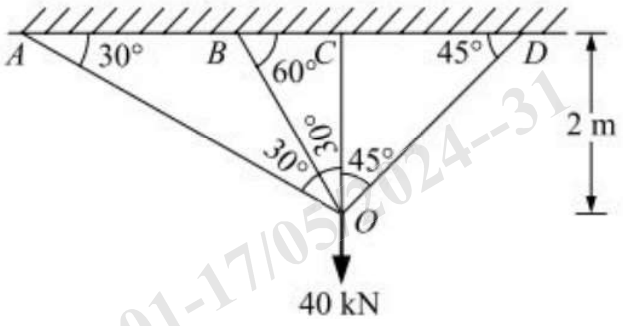
Part-III

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

Q3 A three hinged symmetric parabolic arch having span 50 m and central rise 10m. It carries a concentrated load of 40 kN at distance 15 m from right support and a uniformly distributed load of intensity 20 kN/m over left half portion of the arch. Determine the normal thrust and radial shear at a section 10 m from left end. **(16)**

Q4 Draw the bending moment diagram of a simply supported continuous beam ABC having span length AB = 4m and BC = 6 m. The span AB carries a point load of 20 kN at a distance of 1m from support A and span BC carries a uniformly distributed load of intensity 10kN/m throughout the span (BC). Use three moment theorem. All supports are simply supported. **(16)**

Q5 Determine the forces in all members assuming that the cross-sectional area and young's modulus of elasticity of all members are same. **(16)**



Q6 Draw the influence line diagram for reaction, shear force, bending moment of a cantilever beam of span "L". **(16)**