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

Total Number of Pages : 02

Course: B.Tech
Sub_Code: RCI4C003

4th Semester Regular/ Back Examination: 2022-23
SUBJECT: Structural Analysis-I
BRANCH(S): C&EE, CIVIL
Time : 3 Hour
Max Marks : 100
Q.Code : M282

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 Maxwell's reciprocal deflection theorem.
b) Write the Equilibrium equations for three dimensional analysis.
c) State the principle of minimum potential energy.
d) State Castigliano's first theorem for determining deflection.
e) Differentiate between simple truss and complex truss.
f) Write advantages of arches over beams.
g) State different elements of a suspension bridge.
h) Define influence line diagram.
i) Show normal thrust and radial shear of a three hinged arch with neat sketch.
j) Define conjugate beam.

Part-II

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

a) Differentiate between statically determinate structure and redundant structure.
b) A continuous beam of two equal spans L is uniformly loaded over its entire length. Find the magnitude R of the middle reaction by using the Castiglione's theorem.
c) A symmetric three hinged parabolic arch of rise R and span L is supported its ends on pins at the same level. Determine the value of the horizontal thrust when a load W which is uniformly distributed horizontally covers the whole span. Show also that with this loading there is no bending moment at any point in the arch.
d) A three hinged parabolic arch of span 20m and rise 5m is loaded with a uniformly distributed load of 10 kN/m on the left half of the span of the arch. Calculate the horizontal thrust and vertical reactions. Calculate the bending moment at a section 4m from the right hand support.
e) Calculate the support moments of a continuous beam ABC having span lengths AB = BC = 5 m. All the three supports (A, B, C) are simply supported. The span AB carries a point load of 25 kN at a distance 2 m from support A. The span BC carries a uniformly distributed load of intensity 10 kN/m over the whole span BC.
f) A fixed beam of 10 m span carries a uniformly distributed load of 10 kN/m on the whole span. Find the end moments.

g) A cantilever beam of length 10 m carries a uniformly distributed load of 5 kN/m over its entire length. The cantilever is propped at a distance 6 m from its fixed end. Determine the reaction at the prop.

h) Draw neat diagrams of the influence lines for shearing force and bending moment at a section 3 m from one end of a simply supported beam, 12 m long. Use the diagrams to calculate the maximum shearing force and maximum bending moment at this section due to the uniformly distributed rolling load, 5 m long of 2 kN per meter intensity.

i) State and explain theorem of three moments with example.

j) A three hinged parabolic arch has a horizontal span of 10 m with a central rise of 5 m. A point load of 10 kN moves across from left to right. Calculate the maximum positive and negative moment at the section 8 m from the left hinge.

k) Write note on the Williot Mohr diagram.

l) Write note on Virtual work method with the help of an example.

Part-III

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

Q3 A cantilever beam ABC is fixed at A and propped at C. The portion AB of length 5 m from the fixed end and is loaded with uniformly distributed load of intensity 20 kN/m. The portion BC is of length 3 m is unloaded. Calculate the reaction at prop and draw shear force and bending moment diagram. **(16)**

Q4 Draw the shear force, bending moment diagram of a simply supported continuous beam ABC having span length lengths AB = 10 m and BC = 12 m. The span AB carries a point load of 50 kN at a distance of 4 m from support A and span BC carries a uniformly distributed load of intensity 25 kN/m throughout the span (BC). Use three moment theorem. All supports are simply supported. **(16)**

Q5 A three hinged parabolic arch has a span 60 m and a rise of 15 m. Draw the influence line diagram for horizontal thrust. Further, draw the influence line diagram for the bending moment, normal thrust and radial shear for a section at a distance 8m from the left support. **(16)**

Q6 The three hinged stiffening girder of a suspension bridge of 100 m span is subjected to two point loads of 10 kN each placed at 20 m and 40 m respectively from the left hand hinge. Determine the bending moment and shear force in the girder at section 30 m from each end. Also determine the maximum tension in the cable which has a central dip of 10 m. **(16)**