HILL UNIVERSITY
Established by an Act of the State Legislature of Uttarakhand (Adhiniyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

Term Evaluation (Odd) Semester Examination September 2025

Roll no.....

Name of the Course: B. Tech /CE
Semester: 5Th
Name of the Paper: *Advanced Structural Analysis*
Paper Code: TCE 501
Time: 1.5 hour **Maximum Marks: 50**

Note:
(i) Answer all the questions by choosing any one of the sub-questions
(ii) Each question carries 10 marks.

Q1. (10 Marks)

a. A two hinged parabolic arch of span 20 m and rise 4 m carries an U.D.L. of 50 kN/m on the left half of the span . Find the reactions at the supports and the position and amount of maximum bending moment. (CO1)

OR

b. The three hinged stiffening girde of a suspension bridge of span 120 m is subjected to two point loads of 240 kN and 300 kN at distances 25 m and 80 m from the left end. Find the shear force and bending moment for the girder at a distance of 40 m from the left end. The supporting cable has a central dip of 12 m. Find also the maximum tension in the cable and draw the Bending Moment diagram for the girder. (CO1)

Q2. (10 Marks)

a. A two hinged parabolic arch of span 50 m and rise 5 m carries a central concentrated load of 60 kN. It has an elastic support which yields by 0.0001 mm/kN. Determine the horizontal thrust developed if a temperature rise by 20 ^{0}C neglecting (i) rib shortening and (ii) considering rib shortening, assuming secant variation. Take E=200 kN/mm^2 and I = 5 x 10^9 mm^4. Average area A_m = 10000 mm^2. α = 10 x 10^{-6} /^{0}C. (CO1)

OR

b. The two hinged girders of a suspension bridge have a span of 100 m, the dip of the supporting cable being 10 m. If the girder is subjected to two point loads 200 kN and 400 kN at a distance of 20 m and 40 m from the left end find S.F and B.M. for the girder at 25 m from the left end. Find also maximum tension of the cable. (CO1)

Q3. (10 Marks)

a. Analyze the truss shown in Fig. 1. Assume that the cross sectional area of all members are same. (CO2)

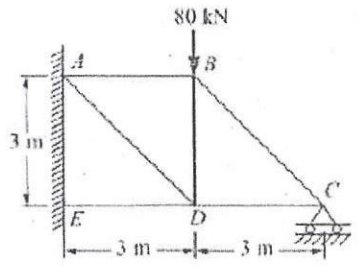

Fig. 1

Term Evaluation (Odd) Semester Examination September 2025

OR

b. Determine the reaction components in the beam as shown in Fig. 2 by Force method. (CO2)

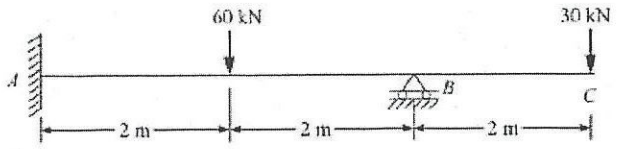

Fig. 2

Q4. (10 Marks)

a. Determine the reaction components in the propped cantilever beam by force method as shown in Fig. 3. Assume EI is constant throughout. (CO2)

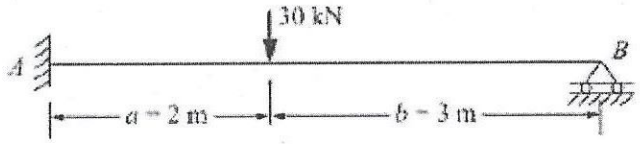

Fig. 3

OR

b. Determine the force in the member of the truss as shown in Fig. 4. The cross sectional area of horizontal and vertical members are 4000 mm^2 and diagonal members are 6000 mm^2. Length of AF=FE=ED = 4 m. (CO2)

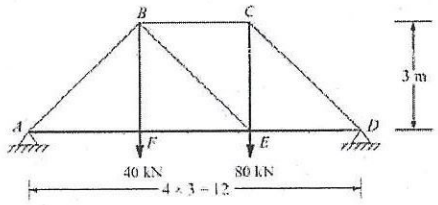

Fig. 4

Q5. (10 Marks)

a. Analyze the pin connected frame as shown in Fig 5. The cross sectional area of each member is 2000 mm^2. Take E= 200 kN/mm^2. (CO2)

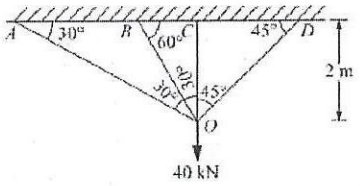

Fig. 9

OR

b. A fixed parabolic arch of span 20 m and central rise 4m has moment of inertia at any section $I=I_0 \sec\theta$, where I_0 is the moment of inertia at the crown and θ is the inclination of the tangent with the horizontal. The left hand half span of the arch carries a UDL of 30 kN/m of the horizontal span of the arch. Determine the reactions at the supports. (CO1)