Ex/CE/PC/B/T/413/2024

B.E. CIVIL ENGINEERING FOURTH YEAR FIRST SEMESTER EXAM 2024

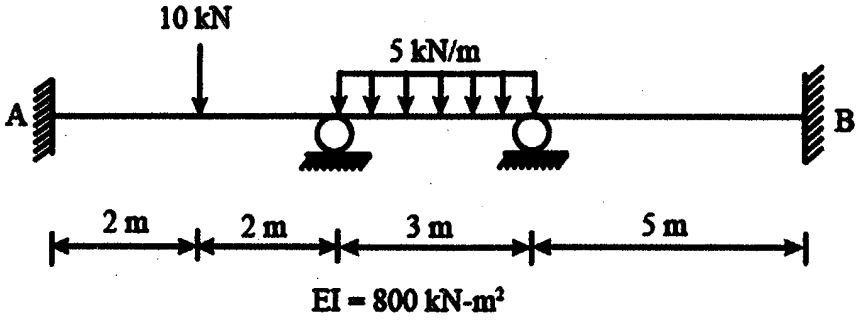
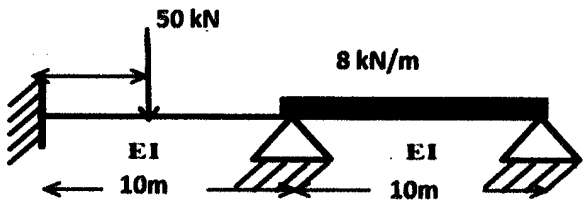
Theory of Structures-III

PART-I

Time: Three Hours | Full Marks 100 (40 marks for 2nd part)

Use a separate Answer-Script for each part

[No code or handbook is allowed]

No. of questions	Part I (answer all questions) (Answer 1,2, and 3)-CO-3 Answer any two from 4,5, and 6)-CO-4	Marks (50)
1 (CO-3)	Derive stiffness matrix of beam element.	(7)
2 (CO-3)	Find the BM diagram of the beam by Flexibility method 	(8)
3 (CO-3)	Draw the B.M, of the following beam by stiffness method.M25 grade of concrete. I=0.0864 m^4. 	(17)
4 (CO-4)	Vibrating system consisting of weight of W=10 kg and a spring stiffness k=20 N/m is viscously damped so that the ratio of two consecutive amplitude is 1 to 0.85. Determine (a) the natural frequency of undamped system (b) logarithmic decrement (c) damping ratio (d)damping coefficient and (e) the damped natural frequency.	(9)
5 (CO-4)	Derive the expression of dynamic magnification factor of a damped harmonic excitation of a SDOF.	(9)
6 (CO-4)	Derive mathematical expression and give example of critical, undamped and overdamped system.	(9)

[Turn over

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B.E. CIVIL ENGINEERING FOURTH YEAR FIRST SEMESTER EXAM 2024

Subject: THEORY OF STRUCTURES -III PART –II TIME:3HRS Full Marks: 100

(50 marks for each part)

Use Separate Answer scripts for each Group / part
Assume necessary data if required

1.	**CO1** a) A two hinged semicircular arch of radius R=12 m. It carries a point load 75 kN at the crown. Find the horizontal thrust at each support. Find also the vertical deflection of the crown under the load. Assume uniform flexural rigidity (EI). (Prove all the necessary formulas). b) A two hinged parabolic arch of span 80 m and rise 7.5 m carries a point load 100 kN at a distance of 25 m from the left support. Find the horizontal thrust at each support. Find also the maximum bending moment. c) A two hinged parabolic arch of span 45 m and rise 8 m is subjected to increase of temperature of 35° C. Find the maximum bending stress at the crown due to temperature rise. The rib section is 850 mm deep. Take E = 2×10^5 N/mm^2 and α = 12.5×10^{-6} per degree centigrade. (Formula need not be proved).	**14+12+6=32**
2.	**CO2** A three-hinge stiffening girder of a suspension bridge of span 120 meter is subjected to two-point loads of 200 kN and 300 kN at a distance 35 meter and 75 meter from the left end. Find the shear force and bending moment for the girder at a distance of 40 meter from the left end. The supporting cable has a central dip of 12 meter. Find also the maximum tension in the cable and draw the bending moment diagram.	**18**