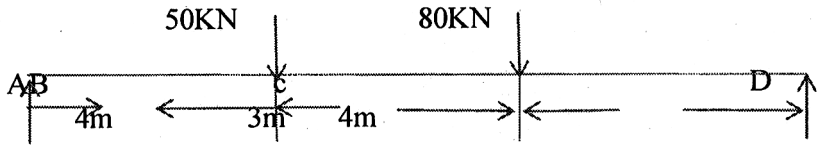
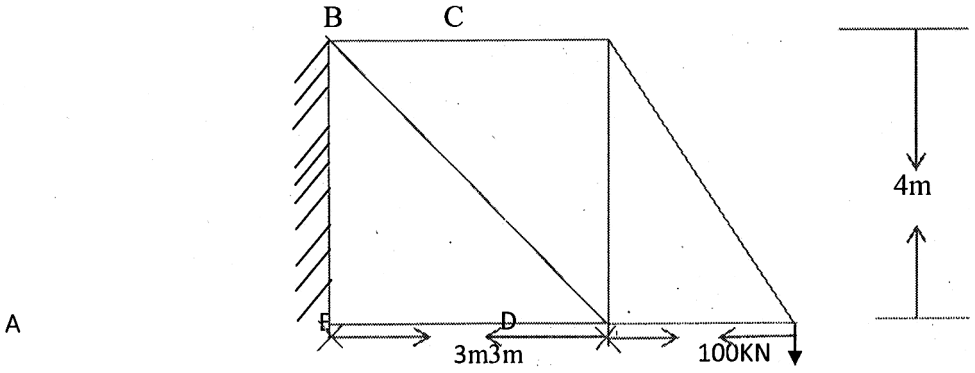
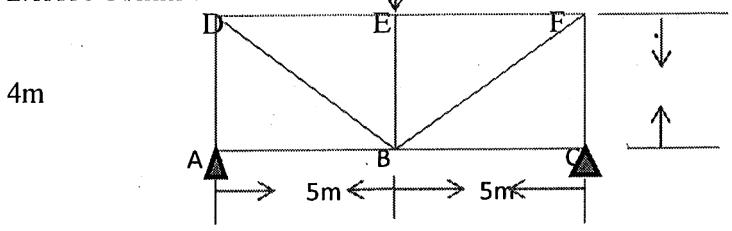
B. Construction Engineering 2nd year2nd SemesterExamination – 2024

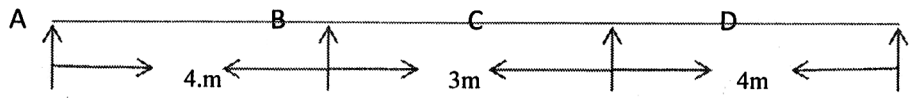
Subject: Theory of structure-I

Total Time: Three hours
Full Marks: 100

PART-I(Full Marks-50)

Use Separate answer sheet for each part.

CO1 [10]	[1] *Answer any one* from **(a)& (b)***in this block:* (a)Show that the deflection of a fixed beam subjected to a UDL is 1/5 times of deflection of Simply supported beam subjected to a same kind of loading. [10] (b) Show that the deflection of a fixed beam subjected to a point load is 1/4 times of deflection of Simply supported beam subjected to a same kind of loading. [10]
CO2 [15]	[2] Answer (a) ,(b) in this block (a) Find the slope & deflection of the continuous beam ABCD as shown in figure. Assume any other data if required. Apply conjugate beam method. AB= I, BC=1.5I, CD=2I [10]  (b)What do you mean by conjugate beam? Write the assumptions of conjugate beam.[5]
CO3 [10]	[3] *Answer any one* from **(a), (b)***in this block:* (a)Determine the vertical downward deflection at point Eof the truss as shown in figure. The cross sectional area of AB=BC=CD=2000mm^2 and AE=ED=2500 mm^2. BE=CE=4000 mm^2. Take E= 2.1X10^{5}N/mm^2. [10]  (b) Find the vertical deflection at point B of the truss as shown in figure. The cross sectional area of all AD=BE=CF=3000mm^2 and DE=EF=AB=BC=4000 mm^2. BD=BF=2000 mm^2. Take E= 2.1X10^{5}N/mm^2. [10] 

CO4 [15]	4.Answer any one from (a), (b) in this block (a) Draw the SFD & BMD of the continuous beam as shown in figure. Use Three moments equations. AB=20KN/m, BC= 25 KN/m, CD= 30 KN/m. [15],  (b) State & explain the claypeyrons three moments theorem. [15]

CO1: **Explain and discuss deflection** of beams, Columns and Struts &**Solve** Area-moment theorems, Classify and solve problems regarding Fixed and Continuous beams (K2)

CO2: **Solve Conjugate beam theorems and** statically determinate and indeterminate structures, supports and reactions (K2)

CO3: **Apply Unit load Method to calculate the deflection of Trusses**(K3)

CO4: **Explain & Solve Theorem of three moments** structural systems. (K2)

CO5: Analyze Columns and Struts in terms of buckling by Euler's theorem, Rankine's formulae, Columns with eccentric load, Bi-axial bending(K4)

Ex/CON/PC/B/T/221/2024

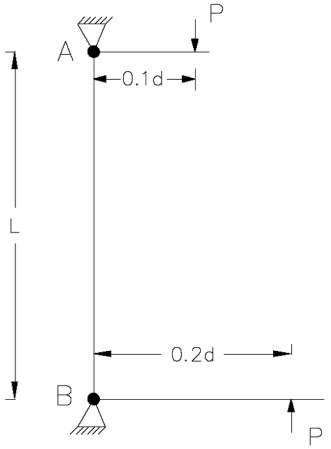
BE SECOND YEAR SECOND SEMESTER (CONSTRUCTION) EXAMINATION - 2024

Subject : **THEORY OF STRUCTURES - I**

Time : Three hours **Full Marks : 100**

Part – II (50 Marks)

*Answer questions as well as parts together & **SERIALLY.** Different parts of the same question should be answered together. Answer question **No. 1** & any **two** from **Block '2'** in pairs. Choice should be in pairs, either (a)(i) & (ii) OR (b)(i) & (ii) should be answered. Please start answering a **NEW** question or part thereof **strictly** from a **NEW** page for the sake of precision & brevity.*

1.	[1] Define & explain a Beam-Column. [CO1] Prove that for a beam column with an axial load **P** at each of the pin jointed ends, the expression for bending moment at mid span is $[M]_{x = L/2} = wL^2/8\ [1+ 1.03(P/PE) + 1.04(P/PE)^2 + \ldots]$ **OR** $= wL^2/8$ when P is such that $P/P_E \leq 1/10$ where w = transverse load per unit run along the beam span, P_E = Euler critical load & **L** is the effective span of the beam column. [CO5] [3 + 15 = 18]	CO1 & CO5 [18]
2.	[2] *Answer any* **one (1)** *from* **(a) & (b)** *in this block* [CO5]*:* (a)(i)A hollow tube ***6.0 M*** long with external & internal diameter ***60 mm*** & ***45 mm*** respectively was found to extend ***5.8 mm*** under a tensile load of ***75 kN***. Find the buckling load for the tube with both ends pinned. Also, find the safe load on the tube taking ***FOS*** as ***4.0*** 16 (ii) A column ***AB*** of a diameter ***'d'*** is hinged at ends carrying two equal & opposite loads ***P*** each at eccentricities as in the figure. Assuming end moments to be applied at the points of support find the condition of the occurrence of the maximum bending moment at a distance ***'x'*** from ***A*** in the column. 16  (b) (i) Determine the ratio of ***Buckling Strength*** of two columns of circular cross sections one hollow & other solid when both are made of the same material, have the same length & cross section area & same end conditions. The internal diameter of the hollow column is half of its external diameter.16 (ii) Determine the expression of maximum compressive & tensile stress of a slim long column with initial curvature in the plane of the least radius of gyration, subjected to axial load '***P'*** with effective length '***l'***. Determine the experimental analysis as pronounced by ***Southwell*** in the case of this column. 16	CO5 [32]