B. Construction Engineering 2nd year 2nd **Semester Examination – 2022**

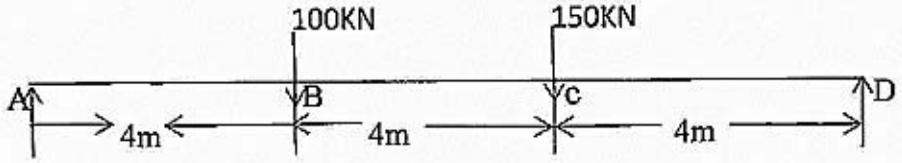
Subject: Theory of structure-I

PART-I(Full Marks-50)

Use Separate answer sheet for each part.

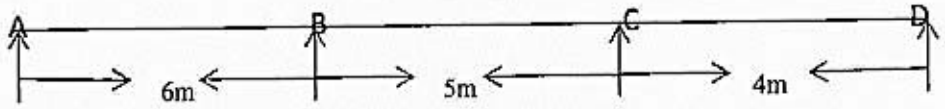
Answer all the questions.

Q. No.	
1.	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= 1.5I, BC=2I, CD=I [10]



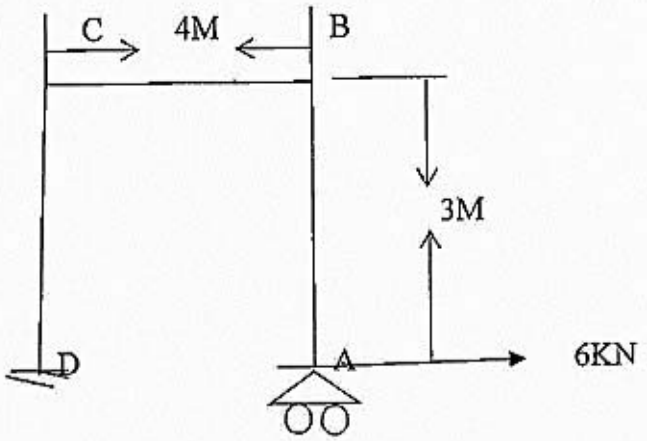
(b)What do you mean by conjugate beam? Write the assumptions of conjugate beam.[5]

2.	Draw the SFD & BMD of the continuous beam as shown in figure. Use Three moments equations. AB=15KN/m, BC= 15 KN/m, CD= 10 KN/m. [10],



3.	State & explain the claypeyrons three moments theorem. [10]
4.	A.) Explain the strain energy principle [5]

B) Determine the Horizontal deflection of Point A in the frame as shown in Figure. Take E= $2X10^5$ N/mm^2. I= $30X10^6$ mm^4 [10]



B. CONS. ENGG. 2ND YR. 2ND SEM. Examination – 2022

Subject : THEORY OF STRUCTURES - I

Time : Three hours **PART - II** **Full Marks: 50**

Answer questions as well as parts there of SERIALLY. Different parts of the same question should be answered together. Answer question No. 1 & any two of the rest. Please start answering a NEW question or part thereof from a new page for the sake of brevity.

CO1 & CO5 [18]	[1] 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 $[M]_{x=L/2} = WL/4\ [1+0.25\pi^2(P/P_E) + \ldots]$ OR $\approx WL/4$, with an error equal to or less than 10%, when P is such that $P/P_E \leq 1/25$, where W = a lateral load at the mid span of the beam, P_E = Euler critical load & L is the effective span of the beam column. [CO5] [3+15=18]
CO5 [32]	[2] *Answer any* **two(2)** *from* (a), (b) & (c) *in this block :* [16 X 2 = 32]

(a) The ends of a vertical column are pin jointed & the top is free to move axially, but lateral movement at the both ends is prevented. The top is subjected to an axial thrust P together with a moment M about the weakest axis of the stanchion, the relevant flexural rigidity of the stanchion in that direction being EI. Show that maximum bending moment in the stanchion is either M or $M / \sin \mu L$, where $\mu = \sqrt{(P/EI)}$ depending on whether P is less than or greater than kP_e, P_e being the value of P at which the deflection of the stanchion becomes too large. Find the value of 'k'.

(b) 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 pro-founded by ***Southwell*** in the case of this column.

(c) A column of length 'L' *fixed* at the base is dragged by a chord tied to its top to make a bent shape as in the figure below making a small angle 'θ' with the vertical. The top end is deflected by a distance 'δ' from the vertical. Prove that a state of elastic instability occurs when the load 'P' is such that $\tan \mu L/\mu L + a/L = 1$