EX/CON/T/222/2018

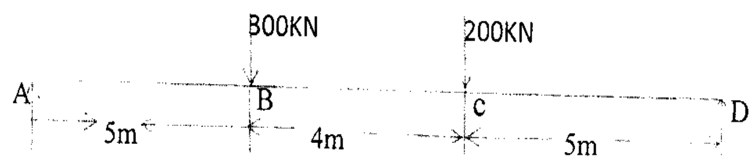
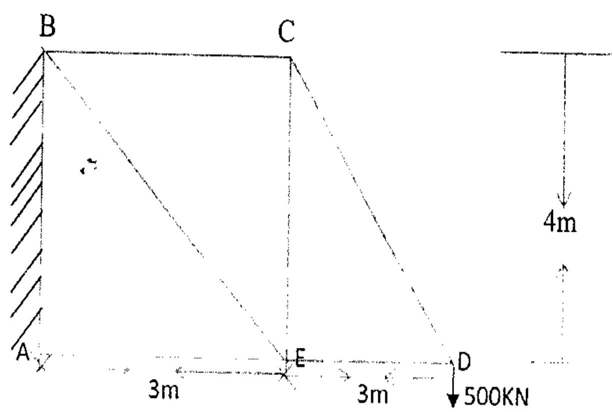
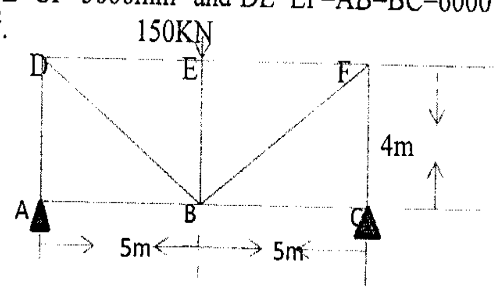
B. Construction Engineering 2nd year 2nd Semester Examination – 2018

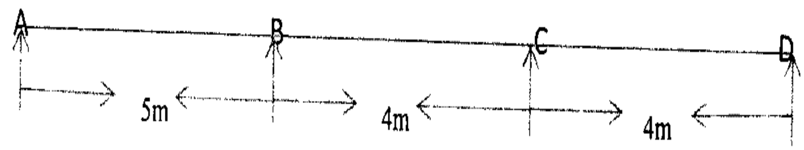
Subject: Theory Of structure-I

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 E of the truss as shown in figure. The cross sectional area of AB=BC=CD=2500mm^2 and AE=ED=3000 mm^2. BE=CE=5000 mm^2. Take E= 2X10^{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=5000mm^2 and DE=EF=AB=BC=6000 mm^2. BD=BF=4000 mm^2. Take E= 2X10^{5}N/mm^2. [10] 

CO4 [15]	3.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=15KN/m, BC= 20 KN/m, CD= 25 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, Classi 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: Analyse Columns and Struts in terms of buckling by Euler's theorem, Rankine's formulae, Columns witl eccentric load, Bi-axial bending(K4)

Ref. No. *Ex/CON/T/222/2018*

B. CONS. ENGG. 2ND YR. 2ND SEM. Examination – 2018

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:* (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_c, P_c 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 $\tan\mu L/\mu L + a/L = 1$