B. CONS. ENGG. 2ND YR. 2ND SEM. EXAM. – 2017

THEORY OF STRUCTURES -- I

Time: 3 Hours Full Marks: 100

Answer questions as well as parts there of ***SERIALLY.***

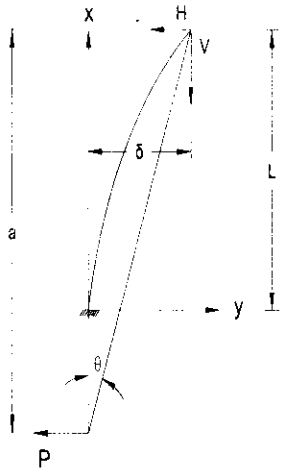
PART - I

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.

1. 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 18

2. 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'. 16

3. 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 $\tan \mu L/\mu L + a/L = 1$ 16



4. 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. 16

Ref. No. EX/CE/IEE/T/222/2017

Bachelor of Construction Engineering

B. Construction Engg. 2nd Year 2nd Semester Exam 2017.

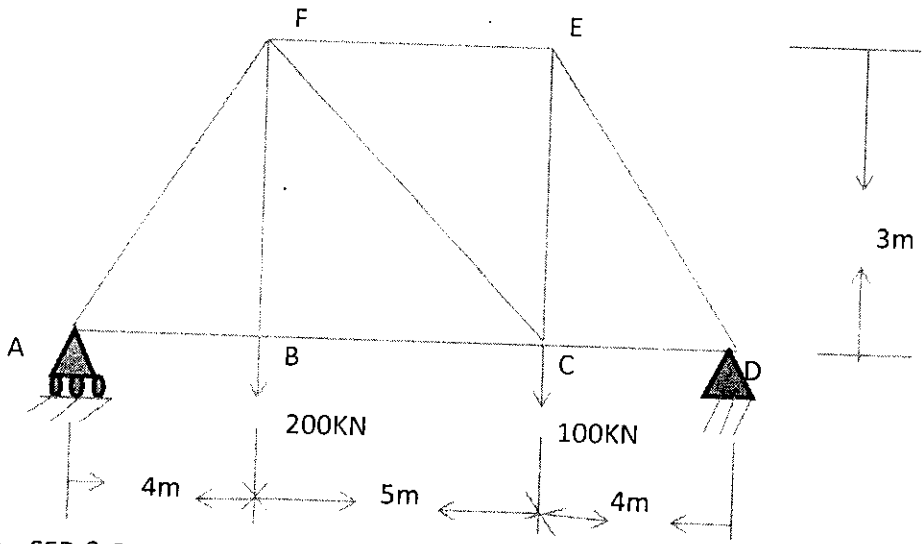
Sub: Theory of Structure-I.

PART-II

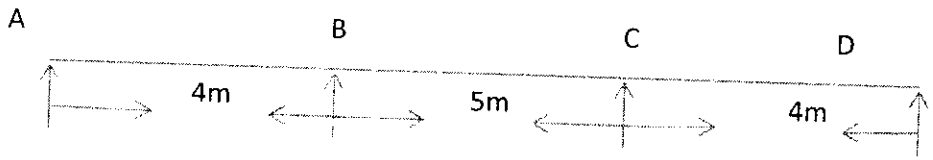
Answer Qs. No. 1 and any two from the rest

Use Separate answer sheet for each part.

1. Determine the horizontal displacement at point A of roller support of the truss as shown in figure. The cross sectional area of all top cord members are 3000mm^2 and other members have cross sectional area are 6000mm^2. Take E= 2X10^{5}N/mm^2. [20]

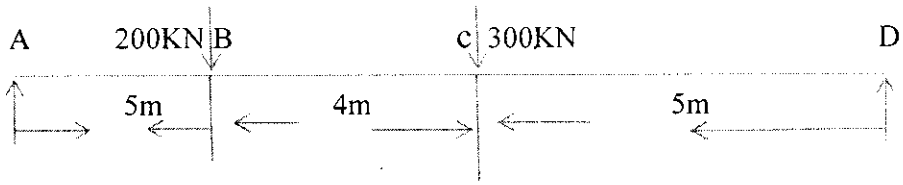


2. Draw the SFD & BMD of the continuous beam as shown in figure. Use Three moments equations. AB=20KN/m, BC= 25 KN/m, CD= 30 KN/m. [15]



3. State & explain the claypeyrons three moments theorem.[10+5=15]
What do you mean by conjugate beam? Write the assumptions of conjugate beam.

4. Find the slope & deflection of the continuous beam as shown in figure. Assume any other data if required. Apply conjugate beam method.AB= I, BC=1.5I, CD=2I



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