Register Number:……..

KUMARAGURU
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B.E DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2018)

Fourth Semester

AERONAUTICAL ENGINEERING

U18AET4003: Aircraft Structures I

COURSE OUTCOMES

CO1: Identify statically determinate and indeterminate structures.
CO2: Analyze the response of statically indeterminate structures under various loading conditions.
CO3: Determine the reactions of structures using strain energy concept.
CO4: Identify different numerical methods available to solve a single structural problem.
CO5: Examine the structural failures using failure theories.

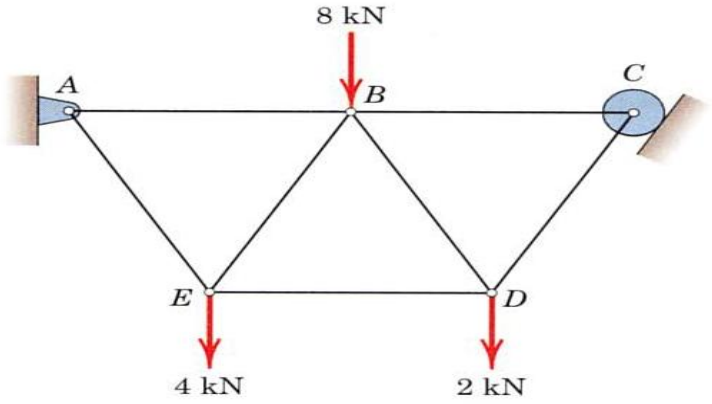
Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	Differentiate between statically determinate and indeterminate structures.	CO1	[K_2]
2.	Explain in detail about the following supports, (i) Fixed support (ii) Ball and Socket support	CO1	[K_1]
3.	Write down the general form of Clapeyron's three moment equations for the continuous beam having different moment of inertia and explain each term.	CO2	[K_1]
4.	Define distribution factor and carry over factor in moment distribution method.	CO2	[K_2]
5.	Briefly explain: strain energy & strain energy density	CO3	[K_2]
6.	Write the Castigliano's first theorem.	CO3	[K_1]
7.	What is slenderness ratio (buckling factor)? What is its relevance in column?	CO4	[K_2]
8.	Define: Short, Medium and Long columns	CO4	[K_1]
9.	List the needs of failure theory.	CO5	[K_2]
10.	The principal stresses at appoint in an elastic material are 200N/mm^2(T),100N/mm^2(T) and 50N/mm^2(C). If the stress at the elastic limit in simple tension is 200N/mm^2, determine whether the failure of the material will occur according to maximum shear stress theory. Take poisson's ratio = 0.3	CO5	[K_3]

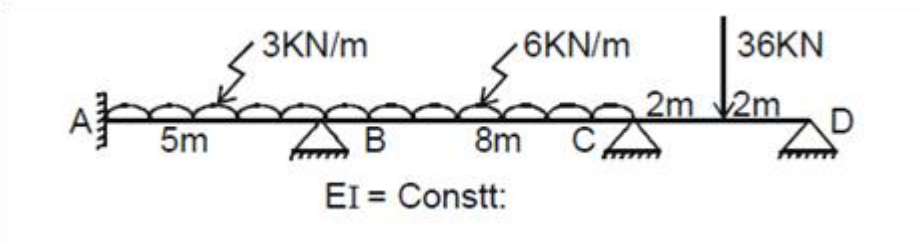
Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11. Solve for the forces in all members in the given truss structure. Neglect any horizontal reactions at the supports. CO1 [K_3]



12. Analyze the continuous beam shown below by three-Moment equation. CO2 [K_4]

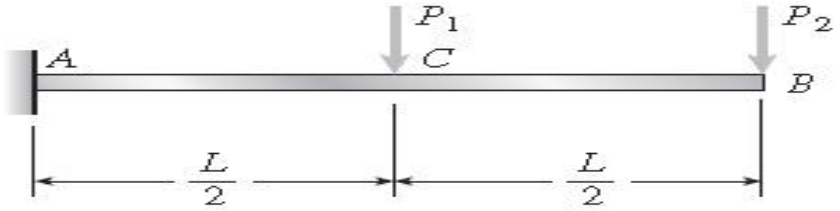
COL [K_L]



13. A cantilever beam ACB supports two concentrated loads P_1 and P_2, as shown in the figure. Determine the deflections δ_C and δ_B at points C and B, respectively. CO3 [K_4]

(Obtain the solution by using the modified form of Castigliano's theorem.)

COL [K_L]

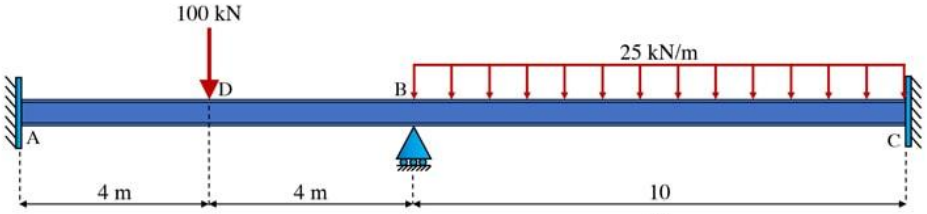


14. Find the Euler's crippling load for a hollow cylindrical steel column of 38mm external diameter and 2.5 mm thick. Take length of the column as 2.3 m and hinged at its both ends. Take E = 205 GPa. CO4 [K_4]

Also determine crippling load by Rankine's formula using constants as 335 MPa and Rankine's Constant 'a' as (1/7500).

15. A steel tube has a mean diameter of 100mm and a thickness of 3 mm. Calculate the torque which can be transmitted by the tube with a factor of safety of 2.25 if the criterion of failure is (a) maximum shear stress; (b) maximum strain energy; (c) maximum shear strain energy. The elastic limit of the steel in tension is 225 MN/m^2 and Poisson's ratio v is 0.3. CO5 [K_3]

16. Using Moment distribution method, find the moments at the supports. CO2 [K_4]



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