B.E/B.TECH DEGREE EXAMINATIONS: NOV / DEC 2024

(Regulation 2018)

Fourth Semester

CIVIL ENGINEERING

U18CET4004**:** Strength of Materials

COURSE OUTCOMES

CO1:   Understand the deformation and strains under different load action and response in terms of forces and moments.

CO2:   Apply engineering principles to calculate the reactions, forces and moments.

CO3:   Analyze the state of stress in three dimension and structural members using various theories of failure.

CO4:   Analyse the long and short columns and determine the design loads.

CO5:   Analyse the unsymmetrical sections and curved beams.

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

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

1.	Write the strain energy formula for determinate beam.	CO1	[K_2]
2.	Define the term Resilience.	CO1	[K_1]
3.	Differentiate the statically determinate structures and statically indeterminate structures.	CO2	[K_2]
4.	What is Propped Cantilever Beam?	CO2	[K_1]
5.	Express the term Tri-axial stress.	CO3	[K_2]
6.	What is Distortion energy theory?	CO3	[K_1]
7.	State the assumptions for Euler's Critical Load for Long Column.	CO4	[K_1]
8.	Write the Rankine's formula for columns.	CO4	[K_1]
9.	State the assumptions made in Winkler's Bach Theory.	CO5	[K_1]
10.	Define shear centre of a section.	CO5	[K_1]

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

11.   A simply supported beam of span L is subjected to a single force P at a distance b   16   CO1   [K4]
from one of the supports. Obtain the expression for the deflection under the load
using Castigliano's theorem. How do you calculate deflection at the mid-point of
the beam?

12.   A continuous beam ABC covers two consecutive span AB and BC of lengths 4 m   16   CO2   [K4]
and 6 m, carrying uniformly distributed loads of 6 kN/m and 10 kN/m throughout
the span respectively. If the ends A and C are simply supported, find the support
moments at A, B and C. Draw also B.M.D and S.F.D.

13.   List and explain different failure theories.   16   CO3   [K2]

14.   A hollow cast iron column of 300 mm external diameter and 220 mm internal   16   CO4   [K3]
diameter is used as a column 4 m long with both ends hinged. Determine the safe
compressive load the column can carry without buckling using Euler's formula
and Rankine's formula E = 0.7×10^5 N/mm^2, FOS = 4, Rankine constant (a) =
1/1600 Crushing Stress (σc) = 567 N/mm^2

15.   Explain the stresses induced due to unsymmetrical bending.   16   CO5   [K4]

16.   A fixed beam AB of length 6m carries point load of 160 kN and 120 kN at a   16   CO2   [K4]
distance of 2 m and 4m from the left end A. Find the fixed end moments and the
reactions at the supports. Draw B.M and S.F diagrams.

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