Register Number:……..

KUMARAGURU
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B.E. DEGREE EXAMINATIONS: APRIL / MAY 2023

(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)

1.	Define strain energy.	CO1	[K_1]
2.	State castigliano's theorem.	CO1	[K_1]
3.	Find the reaction at prop for a propped cantilever subjected to concentrated load at centre.	CO2	[K_3]
4.	Write the three moment equation, stating all the variables used.	CO2	[K_1]
5.	What is meant by principal stress?	CO3	[K_1]
6.	Recall the tem maximum principal strain theory.	CO3	[K_1]
7.	Compare short and long column.	CO4	[K_2]
8.	Write Rankine's – Gordon formula.	CO4	[K_1]
9.	Identify the reasons for unsymmetrical bending.	CO5	[K_2]
10.	List the assumptions made in analysis of curved bars.	CO5	[K_1]

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

11.	Using castigliano's theorem, obtain the deflection under a single concentrated load applied to a simply supported beam shown in figure 1. Take EI = 2.2 MN/m^2	16	CO1	[K$_3$]

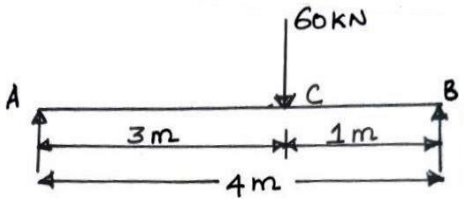

Figure.1

12.	For the propped cantilever shown in figure.2, find the support reactions and draw the BMD.	16	CO2	[K$_4$]

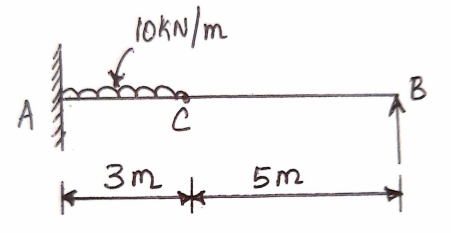

Figure.2

13.	A continuous beam ABC covers two consecutive span AB and BC of lengths 4 m and 6 m, carrying a UDL of 6 kN/m and 10 kN/m respectively. If the ends A & C are simply supported, find the support moments at A, B and C. Draw SF and BM diagram.	16	CO2	[K$_4$]
14.	A shaft is subjected to a maximum torque of 10 kN/m and maximum bending moment of 7.5 kNm at a particular section. If the allowable equivalent stress in simple tension is 160 MN/m^2. Find the diameter of the shaft using maximum strain energy theory. Take μ = 0.24.	16	CO3	[K$_3$]

15. a) A solid round bar 3 m long and 5 cm in diameter is used as a column. Determine the crippling load when the column is used with following end conditions. 10 CO4 [K_3]

i. Both ends are fixed
ii. Both ends are hinged
iii. One end fixed and other end hinged
iv. One end fixed and other end free

Take E = 2 x 10^5 N/mm^2

b) The external and internal diameter of a hollow cast iron column is 5 m and 4 m respectively. If the length of the column in 3 m and both ends are fixed. Determine the crippling load using rankines formula. Take values of σc = 550 N/mm^2 and a=1/1600. 6 CO4 [K_3]

16. Find the resultant stresses at a point 1 and 2 for the frame subjected to a load of 2.4 kN as shown in figure.3. Also locate the position of neutral axis. 16 CO5 [K_3]

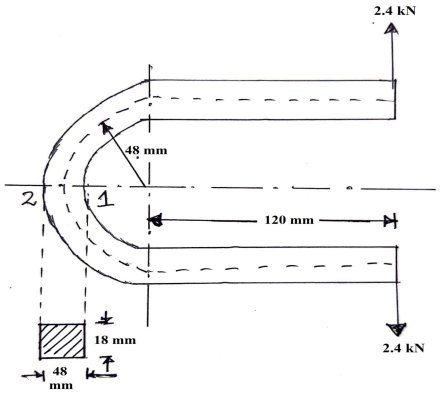

Figure.3

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