R22 Regulation *Subject code: 4E3AB*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech III Semester Regular Examinations, February 2024

STRENGTH OF MATERIALS - I

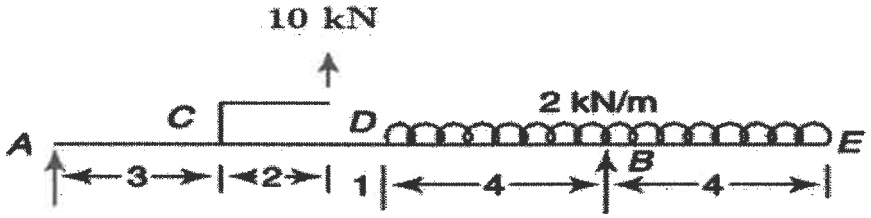
(Civil Engineering)

Maximum Marks: 60 Date:19.02.2024 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

	Part-A	CO	Bloom Tx
All the following questions carry equal marks	(10x1M=10 Marks)		
1.a)	Draw the true stress-strain curve for a ductile material	1	1
b)	State the principle of superposition.	1	1
c)	What do you understand by term point of inflection	2	2
d)	State the important assumptions of pure bending equation	2	1
e)	What is pure bending mean?	3	2
f)	Obtain the expression for shearing stress at a section of a loaded beam?	3	1
g)	State the theorem for conjugate beam method?	4	1
h)	State Moment area theorems to calculate slope and deflection.	4	1
i)	Define principal planes and principal stresses	5	2
j)	What is the importance of Von Misses Theory?	5	2

	Part-B		
Answer All the following questions.	(5X10M=50Marks)		Bloom Tx level
2	a) A rod of 1m length and diameter 20mm is subjected to tensile load of 20kN.The increase in length of rod is 0.30 mm and decrease in diameter is 0.0018mm. Calculate Poisson's ratio, Young's modulus, Bulk modulus and rigidity modulus. [5m]	1	3
	b) Prove that the strain energy stored in a body due to suddenly applied load compared to when it is applied gradually is four times. [5m]	1	
	OR		
3	a) A bar 460 mm long is of diameter 25 mm for an initial length of 200 mm and 40 mm diameter for the remaining length. Find the stresses produced in the individual sections for an applied load of 20 kN and the total elongation. Take E as 200 GPa. [5m]	1	3
	b) Apply and Interpret the Saint-Venant's Principle. [5m]	1	
4	A simply supported beam has a span of 9 m and carries a uniformly distributed load of 20 kN/m over the whole span along with two, point loads of 30 kN and 40 kN at 6 m and 7.5 m respectively from the left-hand support. Draw the shear force and bending moment diagrams indicating values at the point loads. [10m]	2	4

	OR		
5	A 14m simply supported beam with an overhang at the right end is loaded as shown in Fig. It carries a load of 10 kN applied through a bracket and also a uniformly distributed load for 8 m length from the right end. Draw the shear force and bending moment diagram. Also find point of contra flexure. [10m] 	2	4
6	In a simply supported beam of 3 m span with T cross section, a point load of 15kN is applied at a distance of 1 m from the left end. The flange width and thickness are 100 mm and 50 mm respectively. The total depth of the T cross section is 300 mm and the web thickness is 50 mm. Determine the shear stress at a point 30 mm below the top of the flange at mid-span of the beam. Also plot the shear stress distribution across the depth of the beam. [10m]	3	4
	OR		
7	Derive the relation connecting bending moment and bending stress for a beam subjected to pure bending. State all assumptions. [10m]	3	3
8	A horizontal girder of steel having uniform section is 14 m long and is simply supported at its ends. It carries concentrated loads of 120 kN and 80 kN at two points 3 m and 4.5 m from the two ends respectively. I for the section of the girder is 16 x 10^8 mm^4 and Es = 210 kN/mm^2. Calculate the deflection of the girder at points under the two loads and maximum deflection using Macaulay's method. [10m]	4	3
	OR		
9	A simply supported beam of length 6 m carries a point load of 10kN at a distance of 2 m from the right support. Determine slope at left support and deflection under point load using conjugate beam method. Take E =2 x 10^5 N/mm^2 and Moment of Inertia = 2 x 10^8 mm^4. [10m]	4	3
10	At a point in a material, the stresses on two mutually perpendicular planes are 120 N/mm^2 and 40 N/mm^2 both tensile. The shear stresses across these planes is 40 N/mm^2. Determine the principal stresses. Locate the principal planes and determine the normal and shear stresses on a plane inclined at 45 degrees in anticlockwise direction from the major principal plane. [10m]	5	4
	OR		
11	A member is subjected to stresses on two mutually perpendicular planes which are 120MPa (tensile) and 60MPa (tensile). Shear stress across these planes is 30MPa. Find the principal stresses and maximum shear stress at a point by using Mohr's circle. [10m]	5	4