R22 Regulation *Subject code: 4E3AB*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Semester Supplementary Examinations, July 2024

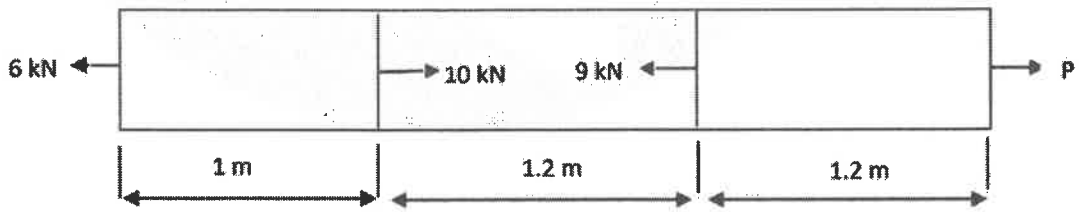
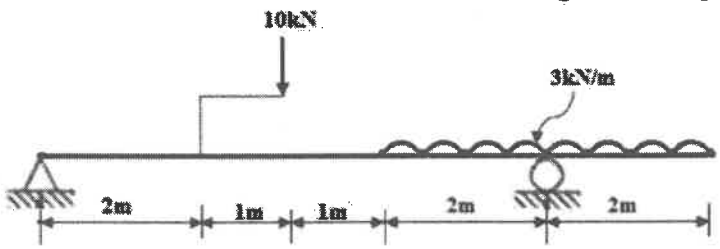
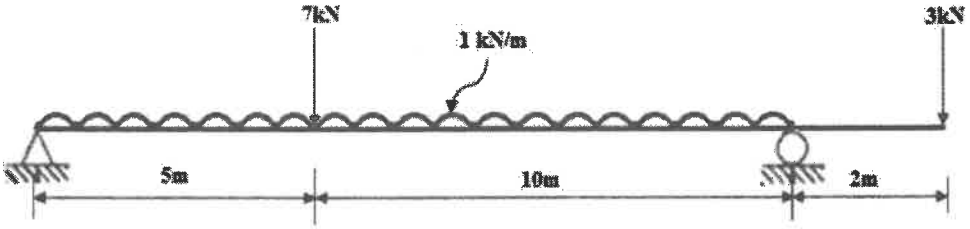
STRENGTH OF MATERIALS - I

(Civil Engineering)

Maximum Marks: 60 Date:20.07.2024 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 stress strain diagram for brittle material.	1	1
b)	Explain Hooke's law for linearly elastic isotropic material.	1	2
c)	Define point of contraflexure.	2	1
d)	What is the relation between load, shear force and bending moment?	2	1
e)	Give the equation of theory of pure bending.	3	1
f)	Write the equation describing the shear stress distribution over the cross section of a beam	3	1
g)	Why and when is moment area method preferred to double integration?	4	2
h)	What is the change in support condition between actual beam and conjugate beam?	4	2
i)	What is Mohr's stress circle? How is it useful in the solution of stress analysis problems?	5	2
j)	Present the condition for theories of failure under maximum shear stress and maximum principal strain theory	5	2
	Part-B		
Answer All the following questions. (5X10M=50Marks)			
2	a) Explain the salient points of a typical stress-strain curve for a mild steel rod subjected to tension test. [5M]	1	2
	b) ABC is a stepped bar subjected to axial pull of 40 kN. The length and diameter of the solid portion AB is 80 mm and 40mm and for the remaining hollow section of length 120mm is having internal diameter 20 mm external diameter 40mm.Determine total strain. What will be the diameter of the bar, if it is a solid section throughout, for the same strain. Take E=200 kN/mm^2 [5M]	1	3
	OR		
3	a) A steel member of uniform cross-sectional area 1000mm^2 is subjected to axial force as shown. Calculate the force "P" required for equilibrium of the member and the total change in length. [5M]	1	3

	 b) Derive the expression for strain energy stored in a body due to impact and shock loadings. [5M]	1	2
4	Draw the shear force and bending moment diagrams for a beam shown in the figure given below. Also determine the value of maximum bending moment. [10M] 	2	4
	OR		
5	Draw the shear force and bending moment diagrams for a beam shown in the figure given below. Locate the point of contraflexure. [10M] 	2	4
6	A simply supported 150 mm wide, 300 mm deep and 4 m long beam carries a uniformly distributed load of 15 kN /m throughout the span. Determine the maximum bending stress and also determine the bending stress at the point which is 50 mm below the top surface and 1.2 m from the left support. [10M]	3	4
	OR		
7	At critical section of a I beam, the value of shear force is 45 kN and the sectional dimensions are: flange width 200 mm, flange thickness 30 mm, web thickness 30 mm and the total depth is 300 mm. Draw the shear stress distribution across the depth of the section. [10M]	3	4
8	A simply supported beam of length 6 m carries a uniformly distributed load of 10 kN/m from 1 m and ending at 4 m from left end. Using Macaulay's method, calculate i) Slope at left end. ii) Deflection at mid span. iii) Maximum deflection. Take E=200 GPa and Moment of inertia I=450x10^{6}mm^4 [10M]	4	4

	OR		
9	a) Explain the procedure for determining the slope and deflection of beams using Moment Area Method. [5M] b) A cantilever of uniform section has a length 'l' and carries a point load W at the free end. Find the deflection at a point 'l/3' from the fixed end. [5M]	4	2 3
10	a) State the significance of stress transformation equations. [5M] b) Explain the construction of Mohr's circle of stresses for a two-dimensional stress system accompanied by shear stress. [5M]	5	2 3
	OR		
11	The normal stresses at a point in an elastic material are 100 MPa (tensile) and 60 MPa (compressive) respectively at right angles to each other with shearing stress of 50 MPa. Determine the [10M] i) Principal stresses and the position of principal planes ii) ii) Maximum shear stress and its plane.	5	4