Indian Maritime University **(A Central Uni6versity, Govt of India)**				
End Semester Examinations – June 2025				
Programme Name: B Tech (Marine Engineering)				
Semester: IV				
Subject Code: UG11T4401				
Subject Name: STRENGTH OF MATERIALS				
Date : 30.05.2025 Duration : 03 Hrs			Max Marks : 70 Pass Marks : 35	
Part A (Part A is Compulsory)				
Q1 [10 x 1 = 10 Marks] Multiple Choice Questions	Options			
(1) The shear force at a section of a beam is zero where the bending moment is:	A) Maximum or minimum	B) Zero	C) Constant	D) Negative
(2) In a cantilever beam with a point load at the free end, the shear force at the fixed end is:	A) Zero	B) Equal to the applied load	C) Half of the applied load	D) Twice the applied load
(3) When a rectangular beam is loaded transversely, the maximum compressive stress develops on	A) neutral axis	B) top fibre	C) bottom fibre	D) middle fibre
(4) The neutral axis of a beam under bending stress is:	A) Axis of maximum bending stress	B) Axis where bending stress is zero	C) Axis where shear force is maximum	D) Axis of least bending moment
(5) The slope at the ends of a simply supported beam carrying a uniformly distributed load is:	A) Maximum	B) Zero	C) Equal at both ends	D) Varies linearly

(6) A continuous beam has:	A) One support only	B) Multiple supports	C) No support	D) Fixed at both ends
(7) Macaulay's method is more convenient for beams carrying	A) Single concentrated load	B) UDL	C) Multi loads	D) None of these
(8) The stress distribution in a thin curved bar is:	A) Uniform	B) Linear	C) Parabolic	D) Circular
(9) For a cantilever beam with a uniformly distributed load, the maximum deflection is proportional to:	A) L^2	B) L^3	C) L^1	D) L^4
(10) What does Rankin's formula determine in column design?	A) Buckling load for columns	B) Direct stress in columns	C) Bending stress in columns	D) Eccentric loads on columns

Q2 [2 x 5 = 10 Marks] - Short Answer Type Questions

(11) What is a point of contra flexure, and how is it significant?

(12) Define the slenderness ratio and its significance.

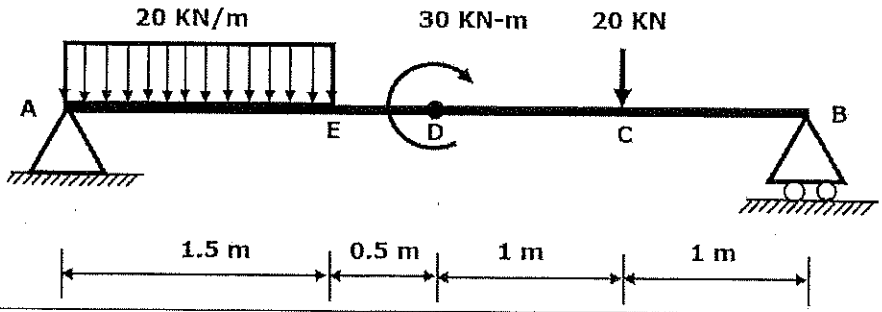
(13) State the assumptions made in the theory of simple bending.

(14) What are the limitations of Euler's buckling theory?

(15) Why moment area method is more useful, when compared with double integration?

Part B (Answer any Five out of Seven) Each Question is for 10 Marks

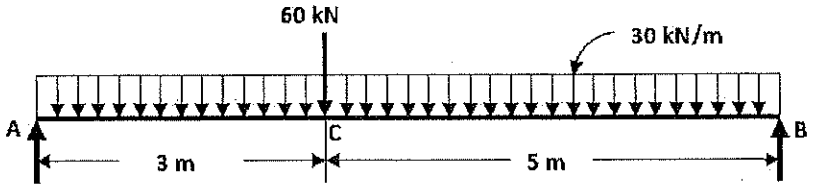
16. Draw the shear force & bending moment diagrams for the beam shown loaded in below figure. Clearly mark the position of the maximum bending moment and determine its value.



17. Derive the expression for the bending stress and the radius of curvature for a straight beam subjected to pure bending.

18. A rectangular beam of width 300 mm and depth 500 mm is subjected to a bending moment of 120 kNm. Calculate the bending stress at the top and bottom fibers and the location of the neutral axis.

19. A beam AB of span 8 meters is simply supported at its end and is loaded as shown in the Figure 2. Determine maximum deflection in the beam and the location where the deflection occurs. Use Macaulay's method. Take I = 80 x 10^{-4} m^4 and E = 200 x 10^6 kN/m^2.



20. A fixed beam AB, 3m long is carrying a point load of 45 kN at a distance of 2m from A. If the flexural rigidity (i.e. EI) of the beam is 1x10^4 kN-m^2. Determine

(i) Fixed end moments at A and B
(ii) Deflection under the Load.
(iii) Maximum deflection
(iv) Position of the maximum deflection

21. A cantilever beam of length L=4m carries a concentrated load of P=20 kN at its free end. Using Castigliano's theorem, determine the deflection at the free end of the cantilever. The flexural rigidity of the beam is given as EI=20000 kNm^2.

22. A steel column of length 5 m with fixed-free ends has a diameter of 150 mm. Determine the critical buckling load using Euler's formula. Given E=210 GPa.