



DEDAN KIMATHI UNIVERSITY OF TECHNOLOGY

UNIVERSITY EXAMINATIONS

2021/ 2022 ACADEMIC YEAR

SPECIAL/ SUPPLEMENTARY EXAMINATIONS – MAY 2022

BACHELOR OF TECHNOLOGY IN BUILDING CONSTRUCTION (B. Tech. 3.2)

COURSE CODE: ECE 5111

COURSE TITLE: THEORY OF STRUCTURES IV

INSTRUCTIONS TO CANDIDATES

- Attempt any THREE (3) questions
- Scientific non-programmable calculators may be used
- Clearly state any assumptions made

TIME: 2 HOURS

This paper consists of 4 printed pages

Question 1 (20 mks)

Draw the shear and bending moment diagrams of the beam shown in **Figure Qn 1** below using the slope – deflection method. $E = 70 \text{ GPa}$, $I = 800 \times 10^6 \text{ mm}^4$ (20 mks)

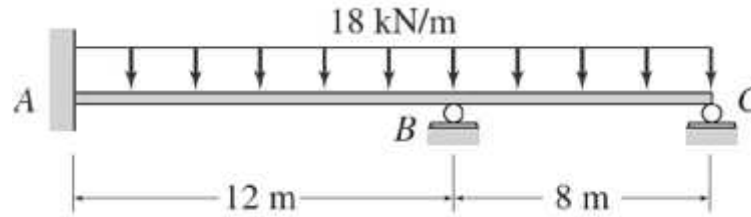


Figure Qn 1

Question 2 (20 mks)

- a. Draw the influence lines for the reaction at support B of the beam shown below in **Figure Qn 2**. Determine the influence line ordinates at 3 m intervals. EI is constant. Take $E = 200 \text{ GPa}$ and $I = 20.1 \times 10^6 \text{ mm}^4$ (10 mks)

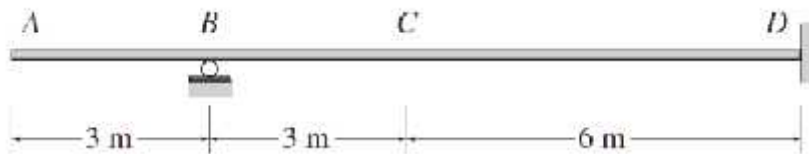


Figure Qn 2

- b. Draw the influence lines for the shear and bending moment at point C of the beam shown in **Figure Qn 2**. Determine the influence line ordinates at 3 m intervals (10 mks)

Question 3 (20 mks)

Determine the reactions R_A , R_B and M_A for the beam shown in **Figure Qn 3** below using the method of consistent deformations, and draw the shear force and bending moment diagrams. Let $P = 100 \text{ kN}$, $L = 10 \text{ m}$, $a = 6 \text{ m}$, $E = 200 \text{ GPa}$ and $I = 198 \times 10^6 \text{ mm}^4$ (20 mks)

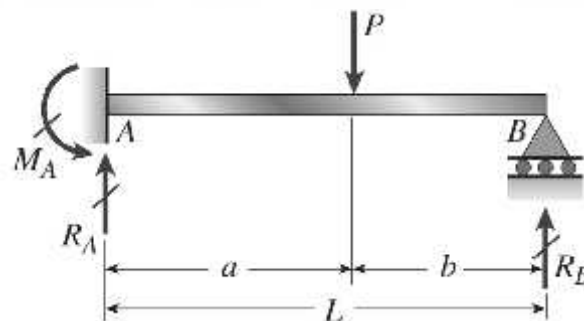


Figure Qn 3

Question 4 (20 mks)

Draw the shear force and bending moment diagrams for the beam shown in **Figure Qn 4** below using the least work method. $E = 200 \text{ GPa}$, $I = 198 \times 10^6 \text{ mm}^4$ (20 mks)

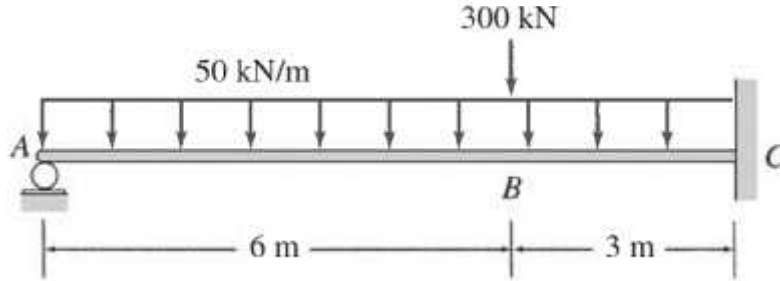


Figure Qn 4

Question 5 (20 mks)

Determine the reactions and draw the shear and bending moment diagrams of the beam shown in **Figure Qn 5** below using the moment - distribution method. Let $E = 200 \text{ GPa}$ and $I = 476 \times 10^6 \text{ mm}^4$ (20 mks)

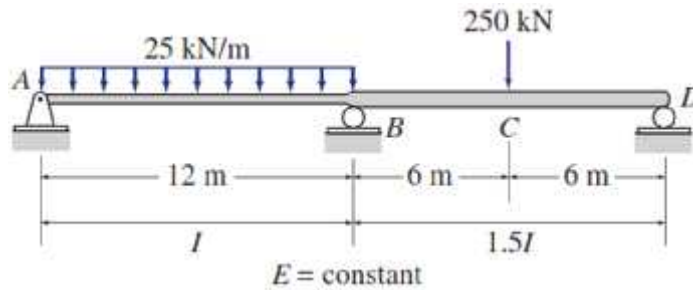


Figure Qn 5

	$0 \leq x \leq a \quad y = \frac{P}{6EI} (x^3 - 3ax^2)$ $a \leq x \leq L \quad y = \frac{Pa^2}{6EI} (a - 3x)$
	$0 \leq x \leq a \quad y = \frac{Pb}{6EIL} (x^3 + b^2x - L^2x)$ $a \leq x \leq L \quad y = \frac{Pa(L-x)}{6EIL} (x^2 + a^2 - 2Lx)$
	$y = -\frac{M}{6EIL} (x^3 - 3Lx^2 + 2L^2x)$