



ZIMBABWE

**MINISTRY OF HIGHER AND TERTIARY EDUCATION,
INNOVATION, SCIENCE AND TECHNOLOGY
DEVELOPMENT**

**HIGHER EDUCATION EXAMINATIONS COUNCIL
(HEXCO)**

NATIONAL CERTIFICATE

IN

CIVIL ENGINEERING

MODULE: Structural Engineering PAPER NO: 313/22/M06

DURATION: 3 Hours

NOVEMBER/DECEMBER 2025 EXAMINATION

REQUIREMENTS

- 1) Graph paper
- 2) Calculator

INSTRUCTIONS TO CANDIDATE

- 1) Answer all questions in section A and section C.
- 2) Answer any two (2) questions in section B.
- 3) Start each question on fresh page.
- 4) Show all workings.

This paper consists of 5 printed pages.

SECTION A

QUESTION 1

- a) Draw simple diagrams to show basic load configurations for the following:
- | | |
|-----------------|-----------|
| i) Compressions | (2 marks) |
| ii) Bending | (2 marks) |
| iii) Shear | (2 marks) |
| iv) Creep | (2 marks) |
- b) Distinguish between coarse aggregates and fine aggregates. (6 marks)
- c) List any six (6) methods of controlling corrosion. (6 marks)

QUESTION 2

- a) Explain the process of firing bricks. (5 marks)
- b) Give advantages and uses of paint in construction. (15 marks)

SECTION B

QUESTION 3

Find the values of the forces M and N for the systems of forces shown in fig Q3.

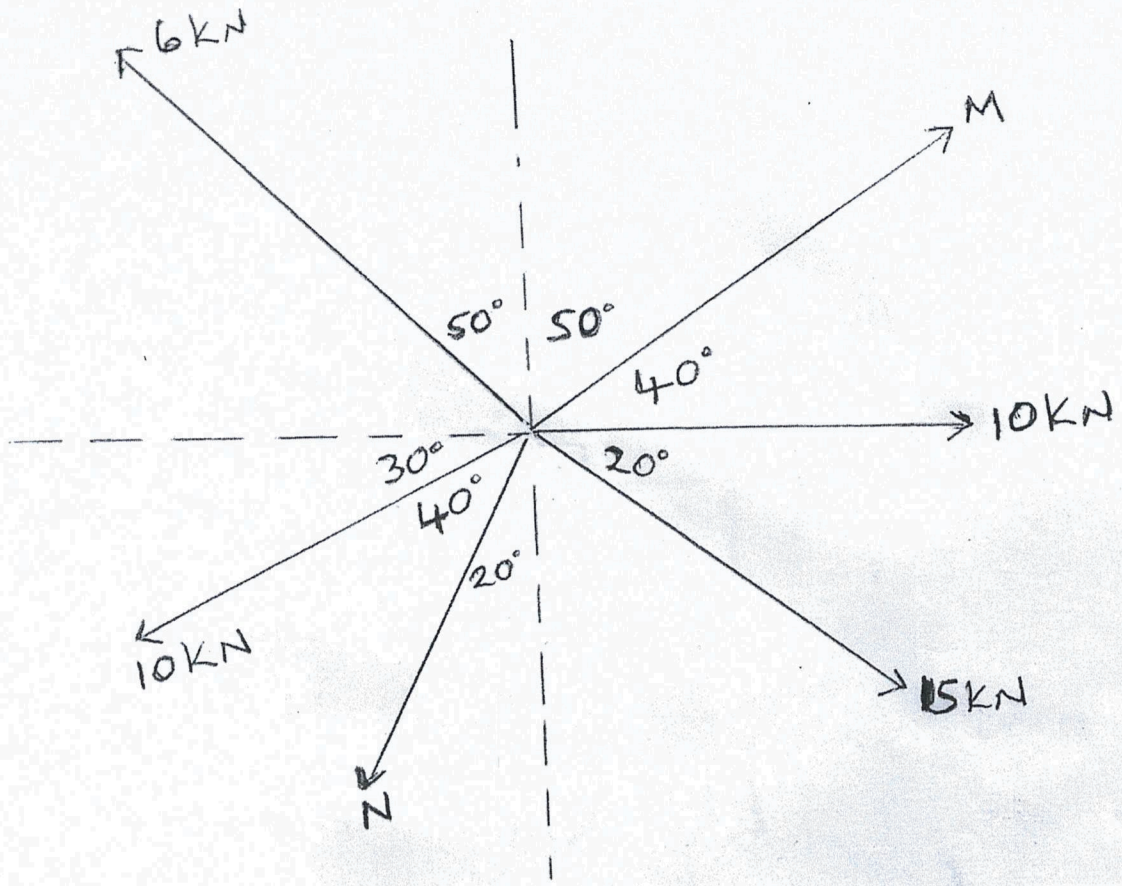
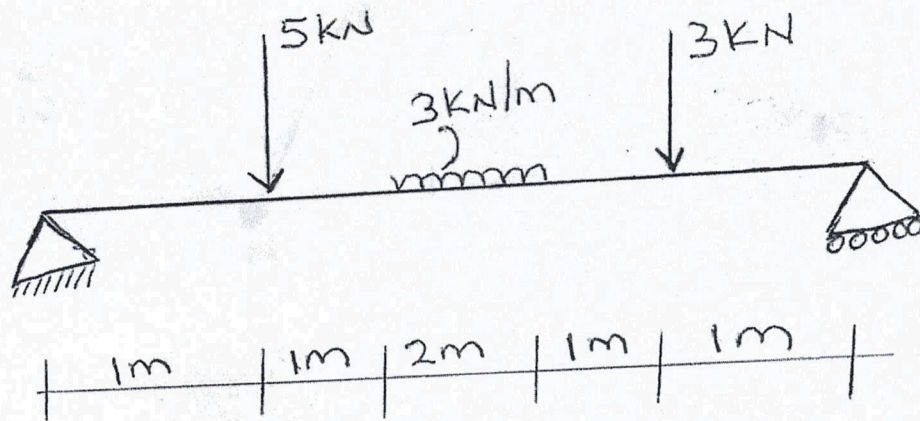


Fig Q3

QUESTION 4

A simply supported beam carries the loading shown in fig Q4:



- a) Determine the reactions of the supports. (6 marks)
- b) Draw the shear force and bending moment diagrams for the beam. (10 marks)
- c) Calculate the value and position of the maximum bending moment. (4 marks)

QUESTION 5

- a) Define the following terms:
 - i) Direct stress (2 marks)
 - ii) Direct strain (2 marks)
 - iii) Modulus of elasticity (2 marks)
 - iv) Force (2 marks)
 - v) Tension (2 marks)
- b) A hollow steel tube 100mm external diameter and 80mm internal and 3mm long is subjected to a load 250kN. Calculate the stress in the material if the elongation is $E=2 \times 10^5 \text{ N/m}^2$. (10 marks)

SECTION C

QUESTION 6

Briefly explain your understanding of the following members of a structure giving examples:

- | | |
|--------------|-----------|
| a) Slab | (4 marks) |
| b) Column | (4 marks) |
| c) Base | (4 marks) |
| d) Beam | (4 marks) |
| e) Staircase | (4 marks) |

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