



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF ARCHITECTURE & BUILT ENVIRONMENT

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN ARCHITECTURE

EAR 2203: BUILDING ENVIRONMENT SCIENCE I

(THERMAL DESIGN)

SPECIAL/SUPPLEMENTARY EXAMINATION

YEAR TWO SEMESTER ONE

SERIES: JULY 2025

TIME: 2 HOURS

DATE: JULY 2025

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

QUESTION ONE (30 MARKS)-COMPULSORY

- In conjunction with sketches, explain FIVE methods used to improve thermal comfort in buildings without implementing mechanical systems. (15 marks)
- Supported by visual sketches, explain how a Trombe wall works in passive solar heating. (5 marks)
- When determining the orientation and design of a building; it is important to carry out a study of the local climate. Explain FIVE areas of study for the research. (10 marks)

QUESTION TWO (15 MARKS)

- a) Explain FIVE ways human beings lose heat to the environment. (10 Marks)
- b) Utilizing illustrations, explain the difference between cross ventilation and stack ventilation. (5 mark)

QUESTION THREE (15 MARKS)

Accompanied by sketches; explain FIVE movable shading devices.

QUESTION FOUR (15 MARKS)

- a) Define the following terminologies
 - i. Luminance. (2 marks)
 - ii. Glare. (2 marks)
 - iii. Azimuth Angle. (2 marks)
 - iv. Light shelf. (2 marks)
 - v. Thermal Mass. (2 marks)
- b) With the aid of a sketch, explain the Daylight Factor (DF). (5 marks)

QUESTION FIVE (15 MARKS)

You are designing a high-rise residential building in an urban environment. Utilizing elaborate sketches, explain how you would ensure adequate natural ventilation for all apartments, particularly those in the middle of the building where cross-ventilation might be difficult?