



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF ARCHITECTURE & BUILT ENVIRONMENT

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN ARCHITECTURE

EAR 2302: BUILDING ENVIRONMENT SCIENCE III

(ACOUSTIC DESIGN)

END OF SEMESTER EXAMINATION

YEAR THREE SEMESTER ONE

SERIES: DEC2024

TIME: 2 HOURS

DATE: DECEMBER, 2024

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, calculator, 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

- a) Define the following terminologies.
- | | |
|--------------------|-----------|
| i. Sound wave. | (2 marks) |
| ii. Intensity. | (2 marks) |
| iii. Pitch. | (2 marks) |
| iv. Loudness. | (2 marks) |
| v. Speed of sound. | (2 marks) |
- b) List FIVE difference between echo and reverberation. (5 marks)

- c) A sound field is the area where sound waves exist in the transmission medium.
Describe FIVE types of sound fields. (15 marks)

QUESTION TWO (15 MARKS)

Sound measurement is a crucial part of acoustic research and determination of acoustic standards. Sound can be measured by the different properties of sound.

- a) Frequency (f) forms one of the vital property of sound that is taken into consideration when calculating sound measurements.
- i. Define the term frequency of sound. (2 marks)
 - ii. Using the frequency(f) formula $F=1/T$ calculate the following: A radio station broadcasts its signal with a frequency of 98.5megahertz, determine the period. (3 marks)
- b) Sound levels (Noise levels) form a crucial part in the determination of sound measurements.
- i. Name the instrument used to measure sound levels (noise levels). (1 mark)
 - ii. Identify the components/ parts of the abovementioned instrument. (3 marks)
 - iii. Give a brief description of the functionality of the instrument mentioned in (i) above. (3 marks)
 - iv. List THREE examples of the instrument mentioned in (i) above. (3 marks)

QUESTION THREE (15 MARKS)

- a) Define a sound reinforcement system. (3 marks)
- b) Installation of a sound reinforcement system involves various key steps. Explain FOUR steps taken during the installation of sound reinforcement systems. (12 marks)

QUESTION FOUR (15 MARKS)

An auditorium is large building or hall used for public gatherings, typically for speeches or stage performances. For efficient functionality of an auditorium proper acoustic design should be taken into consideration.

- a) State the acoustic requirement for a good auditorium. (5 marks)
- b) Describe FIVE factors to be considered to achieve the above mentioned requirements for a good auditorium design. (10 marks)

QUESTION FIVE (15 MARKS)

Humans perceive sound through the human hearing system. For one to understand the human perception of sound one has to understand the human hearing system which involves the study and analysis of the anatomy of the human ear.

- a) Identify the THREE principal parts of the human ear. (3 marks)
- b) Describe the function of each of the parts mentioned in (a) above. (12 marks)