



# TECHNICAL UNIVERSITY OF MOMBASA

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FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

**UNIVERSITY EXAMINATION FOR:**

**BACHELOR OF SCIENCE IN MECHANICAL & AUTOMOTIVE**

**ENGINEERING**

**EMG 2520 : INDUSTRIAL AND ENVIRONMENTAL NOISE CONTROL**

**SPECIAL/SUPPLEMENTARY EXAMINATION**

**SERIES: AUGUST 2017**

**TIME: 2 HOURS**

**DATE: Pick Date Sep 2017**

## 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 any **THREE** questions.

**Do not write on the question paper.**

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## **Question ONE**

(a) With the aid of a well labeled diagram, define the following properties of a sound wave: (10 Marks)

- i. Frequency,
- ii. Wavelength,
- iii. Amplitude,
- iv. Speed,
- v. Direction.

(b) A sound wave travelling in air has a wavelength of  $1.6 \times 10^{-2}$  m. If the velocity of sound is 320 m/s, calculate the frequency and period of the sound. (5 Marks)

(c) An observer stands at a distance of 850 m from a cliff and fires a gun. After what time gap will he hear the echo, if sound travels at a speed of 350 m/s in air? (5 Marks)

## Question TWO

- (a) Define the following terms; (10 Marks)
- Phon,
  - Decibel,
  - Hearing Loss,
  - Loudness,
  - Noise.
- (b) Determine the combined sound pressure level (SPL) for four sources with pressure levels of 48 dB, 90 dB, 97 dB and 87 dB respectively. (6 Marks)
- (c) Differentiate between temporary threshold shift and noise-induced permanent threshold shift as used in noises. (4 Marks)

## Question THREE

- (a) Define the following; (8 marks)
- Equivalent Noise Level,
  - Day-Night Level,
  - Exceedance Level,
  - Noise Pollution level.
- (b) In one area of an industrial plant, the octave band sound pressure level spectrum is given in the table below;

Octave band center frequency, Hz								
	63	125	250	500	1000	2000	4000	8000
$L_p(\text{OB}), \text{dB}$	59	65	70	73	69	65	59	50

Determine the maximum distance between the speaker and listener (both males) for communication in:

- raised voice ( $K = 60 \text{ dB}$ ), (6 Marks)
- loud voice ( $K = 66 \text{ dB}$ ). (6 Marks)

## Question FOUR

- (a) Outline and discuss 5 features of the legislation of noise regulations rules under the Environmental Protection act of 1986. (10 Marks)
- (b) A worker is exposed to a sound level of 100 dBA for 30 minutes in a metal forming area; then the worker spends 3 hours in a stock preparation area. The remainder of the 8-hour day is spent in the stockroom, where the noise level is 65 dBA. Determine the maximum allowable sound level in the stock preparation room for the worker to be in compliance with the OSHA criteria. (10 Marks)

## Question FIVE

- (a) Discuss 3 main effects of industrial and environmental noise pollution. (6 marks)

- (b) Give at least 4 recommendations that can be used to mitigate the effect of adverse sound levels. (4 marks)
- (c) List 5 environmental variables that affect sound and noise measurement. (5 marks)
- (d) List 5 silencers or noise mufflers and their recommended areas of application. (5 marks)