TECHNICAL UNIVERSITY OF MOMBASA

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

(PAPER 1)

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2016

TIME: 2 HOURS

DATE: Pick Date Dec 2016

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.

Question ONE

(a) Explain the meaning of the following terms; (10 Marks)

i. Sound,
ii. Sound Power,
iii. Sound Intensity,
iv. Loudness,
v. Sound Pressure.

(b) A boy whistles with the power of 0.5×10^{-4} W. What will be the sound intensity at a distance of 5 m? (5 Marks)

(c) A machine produces sound with an intensity of 1 nW/m^2. Calculate the intensity level equivalent to this sound intensity. (5 Marks)

Question TWO

(a) Explain the meaning of the following terms; (8 Marks)

i. Noise
ii. Discrete Frequency Noise
iii. Broadband Noise
iv. Impact Noise.

(b) Briefly discuss the difference between the A, B and C – weighting scales. (6 Marks)

(c) During a 1 hour period, the A-weighted sound level is 60 dBA for 15 minutes, 76 dBA for 30 minutes, 65 dBA for 20 minutes and 74 dBA for 10 minutes. Determine the energy equivalent sound level. (6 Marks)

Question THREE

(a) Explain the meaning of the following terms; (10 Marks)

i. Audible Frequency Range
ii. Infrasonic Sound
iii. Phon
iv. Sone
v. Ultrasonic Sound.

(b) Differentiate between: (4 marks)

i. Perceived Noise Level (PNL) and Equivalent Sound Level.
ii. Temporary Threshold Shift (TTS) and Noise-Induced Permanent Threshold Shift (NIPTS).

(c) 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(OB), dB	59	65	70	73	69	65	59	50

Determine the maximum distance between the speaker and listener (both males) for communication in normal voice (K = 54 dB). (6 marks)

Question FOUR

During a typical working day (8 hours), a worker in a shop must spend 2 hours operating a punch press, where the sound level is 97 dBA. The worker spends 4 hours preparing stock for the punch press in a space where the

sound level is 92 dBA. The remainder of the day is spent in other work activities in an area where the sound level is 75 dBA. (20 marks)

(a) Is this noise exposure in compliance with the OSHA regulations?

(b) Determine the noise exposure dosage.

(c) If the exposure is not in compliance, the worker may be allowed to spend more time on other work activities in the 75 dBA area and less time around the punch press. Determine the maximum time that the worker can be allowed to work around punch press in order to comply with OSHA regulations.

(d) If the exposure is in compliance, the worker may be allowed to spend more time around the press. If this is the case, determine how much time the worker can spend around the press and still be in compliance with the OSHA regulations.

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)