TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

UNIVERSITY EXAMINATION FOR:

BSC. MECHANICAL ENGINEERING Y5S2

EMG 2520 : INDUSTRIAL AND ENVIRONMENTAL NOISE CONTROL

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: Pick Date Select Month Pick Year

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 as applied in noise control

(i) Ultrasound
(ii) Infrasound
(iii) Reverberation
(iv) Travelling wave
(v) Standing wave
(vi) Wave number (6Marks)

(b) A Sound wave having a frequency of 250Hz is transmitted through air at 25°c. the gas constant for air is 287J/kg-K and the specific heat ratio is $\gamma = 1.4$. Determine the speed of sound, the wave length and wave number for this condition. (6Marks)

(c) The wavelength of a sound wave is 305mm. Determine the frequency and wave number for a plane sound wave propagated in

(i) Air at 20°c, R=287J/kg-K, $\gamma = 1.4$ and
(ii) Helium 20°c, R=2078J/kg-K, $\gamma = 1.667$ (8Marks)

Question TWO

(a) Explain the following terms used in analysis of levels of spectra

(i) Acoustic pressure
(ii) Acoustic particle velocity
(iii) Acoustic intensity
(iv) Acoustic energy density
(v) Specific acoustic impedance
(vi) Pure tone (9 Marks)

(b) A plane sound is transmitted through air at 25° c and 101.3 kPa. The speed of sound in the air is 346.1m/s. The sound wave has an acoustic pressure (rms) of 0.2Pa. Determine the rms acoustic particle velocity.
. (4Marks)

(c) A plane sound wave is transmitted through air where speed of sound is 346.1m/s, characteristic impedance is 409.8rayl at 25° c and 101.1kPa. the sound wave has an acoustic pressure (rms) of 0.2Pa. Determine the acoustic intensity and acoustic energy density for the wave. (7Marks)

Question THREE

A spherical source of sound produces an acoustic pressure of 2Pa at a distance of 1.2m from the source in air at speed of sound 346.1m/s, characteristic impedance 409.8rayl, 25℃ and 101.3kPa. The frequency of the sound wave is 125Hz. Determine

(i) The wave number
(ii) The rms acoustic particle velocity
(iii) The acoustic energy density
(iv) Acoustic intensity,

for sound wave 1.2m from the source. (20Marks).

Question FOUR

(a) Explain the following characteristics of sound and how they are perceived by human ear

(i) frequency
(ii) Loudness (6 Marks)

(b) Operation health and safety act (OSHA) provides values of noise levels that should not be exceeded in the working environment. Explain seven engineering measures that should be implemented to reduce worker exposure to noise. (14Marks).

Question FIVE

An employee works one hour where the sound level is 90Dba. The worker inspects gauges and other items for two hours where the sound level is 92dBA. A total of three hours is spent in an area around a compressor where the sound level is 94dBA. The remaining 2hours are spent in a relatively quiet office area where the sound level is 60dBA. Determine whether this employee's noise exposure violate OSHA regulations and recommend

the appropriate engineering and administrative measures of controlling noise in whichever area where stipulated noise exposure levels are exceeded. (20Marks).