



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

SPECIAL/SUPPLEMENTARY 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). Define the following terms as applied in noise control

- (i) Phon
- (ii) Decibel
- (iii) Hearing loss
- (iv) Infrasonic
- (v) Ultrasonic
- (vi) Loudness

(8Marks)

(b) Explain the following terms used in frequency weighting scales

- (i) C weighted sound pressure level
- (ii) Perceived Noise Level
- (iii) Equivalent noise level
- (iv) Day-Night Level

(6Marks)

(c) A Sound wave having a frequency of 300Hz 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)

Question TWO

The hourly equivalent sound levels measured outdoors at a particular location are given in the following table. Determine the Day-Night level for this data.

Day time		Night time			
Time	L_A dBA	Time	L_A dBA	Time	L_A dBA
7.00am	50	3.00pm	60	10.00pm	40
8.00am	60	4.00pm	60	11.00pm	40
9.00am	70	5.00pm	70	12.00mid	40
10.00am	60	6.00pm	60	1.00am	30
11.00am	60	7.00pm	60	2.00am	30
12.00noon	60	8.00pm	50	3.00am	30
1.00pm	60	9.00pm	50	4.00am	30
2.00pm	60			5.00am	30
				6.00am	40

(20 Marks)

Question THREE

(a) The optimum design of a silencer involves several requirements, some of which may be in conflict with others: consequently the muffler design will involve consideration of interactions of the various design criteria. Discuss the design requirements for a muffler.

(14 Marks)

(b) 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. (6Marks)

Question FOUR

(a) 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.

(6Marks)

(b) The noise levels in a normal suburban area are given in the table below. The area has had some prior experience with intrusive noises. There are no pure tone components of the noise, and it is not impulsive. The noise source will be present year round. Determine the anticipated community response to the noise source.

(14 Marks)

Duration A-weighted level fraction
Day time 4 hours 60dBA $t=4/15=0.2667$

6 hours 55dBA	$t = 6/15 = 0.4000$
5 hours 50dBA	$t = 5/15 = 0.3333$
<u>Night time</u>	
2 hours 45dBA	$t = 2/9 = 0.2222$
7 hours 40dBA	$t = 1/9 = 0.7778$

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).