Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2021/2022

COURSE NAME	:	ACOUSTICS AND LIGHTING
COURSE CODE	:	BFB 41103
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	JULY 2022
DURATION	:	3 HOURS
INSTRUCTION	1.	ANSWER ALL QUESTIONS
	2.	THIS FINAL EXAMINATION IS AN **ONLINE** ASSESSMENT AND CONDUCTED VIA **CLOSED BOOK**.
	3.	STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

Q1. (a) (i) Sound is produced, resulting from a travelling wave transmitted either in the air, solid or liquid. In condition wheares the temperature is at a room temperature, figure out the mediums that a sound with a frequency of 500 Hz travel, if refraction effects between the two mediums caused the wavelength to expand from 0.68 m to 2.80 m.

(4 marks)

(ii) The sound wave propagation method is depending on the surface of the material that the wave hits. Illustrate the wave propagations when a sound strikes a plastered brick wall with a layer of absorbing material on its surface.

(8 marks)

(b) (i) Transmission of sound wave can be from outside of a building to inside, or from one space to another space. In a building constructed using suspended ceiling and rised wooden floor, illustrate **TWO (2)** ways of sound being transmitted between spaces.

(5 marks)

(ii) A loudspeaker produced steadily sound of $12x10^{-5}$ watt for 15 minutes. If you are standing at point A which is 3 meters away from the speaker, and 5 minutes later moved to point B which is three times of the radius from the first standing position, calculate the sound intensity level at both positions and justify the loudness between both standing positions.

(8 marks)

Q2. (a) You have been given a task to conduct a research on sound propagation at a football field and inside a hall. In the research, an omnidirectional speaker with sound power level of 80 dB is used as the sound source, positioned at the centre of the field and the hall. Meanwhile, the sound level meter/microphone is set at 5 meters away from the sound source. Findings showed that the sound pressure level measured inside the hall is louder compared to the sound pressure level measured at the same distance on the football field. Discuss in detail on pressure variation for both scenario.

(10 marks)

(b) Your company is moving into a new building located nearby MRT station in Sungai Buloh. This new office is a three-storey shop lot with an open working space equipped with centralised HVAC system, and the MRT station is just 10 meters away opposite of your office building.

(i) Discuss the possible noises that might disturb the occupants of the buiding .

(5 marks)

(ii) Propose **FIVE (5)** improvement works needed for the new office in order to control/reduce noises from outside and inside of the building.

(10 marks)

Q3. (a) Ambient lighting, task lighting and accent lighting are the three basic types of lighting normally used in a building for different purposes.

(i) Figure out the function of an accent lighting used to illuminate a dining hall of a fine dining restaurant.

(3 marks)

(ii) In your opinion, which type of light is most suitable to be used as an accent lighting to create a focal point on a wall art. Justify your answer.

(4 marks)

(b) Light is a form of energy that is always moving through matter or space. Light wave propagates and react differently, either reflect, refract or diffract when it strike on a surface/penetrate through different mediums.

(i) Relate and explain the theory on light phenomena as shown in **Figure Q3 (b)** with natural phenomena in the sky.

(8 marks)

(ii) Predict what will happen when the sun rise and shine brightly; and the sky turned to be cloudy after few hours. Provide **THREE (3)** justifications and you may include necessary sketches to support your answer.

(10 marks)

Q4. (a) A windowless hall need to be illuminated for 15 hours per day, for six days per week for 50 weeks in a year. The floor area of this hall is 240 m^2 and overall illumination of 450 lux is to be maintained over the whole floor. The total light loss factor for the installation is 70%. Based on the two light options given in **Table 1**, compare which light is more cost effective for the hall lighting system if the electricity cost is 25 cent per kWH.

(10 marks)

(b) Malaysia is a country with warm, humid tropical climate. Our local climate conditions and consistent daylight available daily from 8 am to 6 pm (1200 lux and 9000 lux) is very ideal for daylight harvesting to be practiced in most buildings in this country. Based on Malaysia local climate, discuss **FIVE (5)** reasons why it is ideal for office buildings in Malaysia to utilize daylight as a part of energy saving strategy.

(15 marks)

-END OF QUESTIONS-

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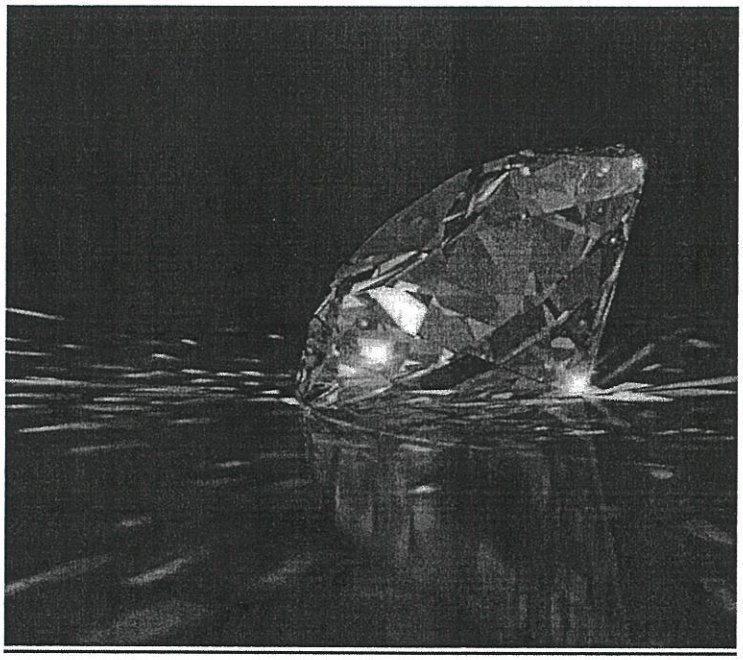

Figure Q3 (b): Big diamond

Table 1: Light options for hall lighting system

Light options	*100 W Tungsten filament*	*65 W tabular fluorescent*
Efficacy	12 lumens per watt	NA
Initial output	NA	5400 lumens
Life cycle	3000 hours	12, 000 hours
Unit cost	RM2.50	RM10.00