Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2014/2015

COURSE NAME	:	BUILDING SERVICES II
COURSE CODE	:	BFB 40703
PROGRAMME	:	4 BFF
EXAMINATION DATE	:	DECEMBER 2014 / JANUARY 2015
DURATION	:	3 HOURS
INSTRUCTION	:	A) ANSWER **ALL** QUESTIONS IN SECTION A AND SECTION B B) ANSWER **TWO (2)** QUESTIONS IN SECTION C.

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

SECTION A: Answer ALL questions. Choose the correct answer.

Q1 When the amplitude of sound pressure is larger, the sound is:

A. higher in frequency
B. larger in wavelength
C. louder
D. moving faster

(2 marks)

Q2 The speed of sound is different when the sound is travelling at different:

A. pressure
B. amplitude
C. frequency
D. medium

(2 marks)

Q3 The following are types of airborne sound transmission, **except:**

A. Impact sound transmission
B. Flanking transmission
C. Overhearing
D. Direct sound transmission

(2 marks)

Q4. A packet of electromagnetic radiation is called a _____.

A. photon
B. ozone
C. proton
D. neutron

(2 marks)

Q5 The three subtractive primary colours are _____.

A. Cyan, Magenta, and White
B. Indigo, Magenta, and Yellow
C. Cyan, Yellow, and Black
D. Cyan, Magenta, and Yellow

(2 marks)

SECTION B: Answer ALL questions.

Q6 (a) (i) Define sound power and sound pressure.

(4 marks)

(ii) Differentiate between sound power and sound pressure.

(1 marks)

(b) Calculate the sound pressure (p) for a sound that has sound pressure level (L_p) of 78 dB. (Reference level: 20μPa)

(5 marks)

(c) Classroom A is a room consists of four hard walls, a hard tiles floor and the room is equipped with plastic chairs. Classroom B is a room in which the floor is covered by carpet, all walls are installed by fiberboard panels and the room is furnished with cushion chairs.

(i) Compare these two classrooms in term of their acoustical performance as teaching and learning spaces and the "reverberation times" of both rooms.

(6 marks)

(ii) Discuss how "reverberation time" can be applied to the auditorium or concert hall acoustics.

(4 marks)

Q7 (a) A heavy engineering factory with a floor area of 120 m long and 80 m wide is to be illuminated by artificial lighting for 15 hours per day, for 5 days per week and 48 weeks per year. An overall illumination of 250 lux is to be maintained over the whole floor. The overall light loss factor for lighting installation is 70 %. If the electricity cost is RM0.40 / kWh, determine the electricity cost per year for each of the following lighting systems:

(i) Using 150 W tungsten-halogen lamps, with efficacy of 22 lumen/Watt, and need replacing every 2,000 hours. The lamp costs RM15.90 per unit.

(10 marks)

(ii) Using 80 W tubular fluorescent warm white lamps with efficacy of 85 lumen/watt and are expected to provide 12,000 hours of service. The lamp costs RM25.00 per unit.

(5 marks)

(b) Compare the total costs of each lighting system above if they are to serve for **THREE (3)** years and make a recommendation as to which is preferable.

(5 marks)

SECTION C: Answer TWO (2) questions only.

Q8 (a) Noise is an unwanted sound. In our surroundings, noise can be produced by many sources. Describe **FIVE (5)** common types of environmental noise.

(5 marks)

(b) The sound power level of an automatic routing machine which located on the floor is 100 dB. The machine is to be installed in a small factory of 20 m (length) x 8 m (width) x 5 m (height). The internal surfaces are untreated and the average reverberation time is 1.5 seconds. Calculate the sound pressure level at the operator position, which is 8 metres from the router. Consider the room consists of both direct and reverberation sound paths.

(10 marks)

Hints:

$$T = \frac{0.161V}{S\bar{\alpha}}$$

$$R_c = \frac{S\bar{\alpha}}{1-\bar{\alpha}}$$

$$L_{p(total)} = L_w + 10\log_{10}\left(\frac{Q}{4\pi r^2} + \frac{4}{R_c}\right)$$

(c) With the aid of sketches, explain how interiors can be illuminated by daylight.

(10 marks)

Q9 (a) A loudspeaker produces a sound pressure level of 115 dB at 1 meter. Calculate the sound pressure level at 6.1 meter away from the loudspeaker.

(3 marks)

(b) Compare the difference between "airborne noise" and "structure-borne noise".

(2 marks)

(c) Estimate the average sound reduction index of a 20 m^2 wall that consists of materials as shown in **Table Q2**.

Table **Q2**

Materials	**Quantity**	**Area/ unit (m^2)**	**Sound reduction index/ unit**
Concrete wall	1	14.5	48 dB
Timber door	1	2.5	43 dB
Glazed window	2	1.5	38 dB

(5 marks)

(d) There are two dormitories at the ground floor of hostel that separated by a common partition. The dimensions of the bigger dormitory are 15 m (length) x 6 m (width) x 4 m (height). The smaller dormitory has dimensions of 8 m (length) x 6 m (width) x 4 m (height). In the larger dormitory, students are making noise with the noise level of 85dB. If the sound reduction index of the common partition is 30 dB and the total absorption of the smaller dormitory is 10 m^2, calculate the noise level in the small dormitory.

Hint:

$L_2 = L_1 - SRI + 10 \log S_p - 10 \log A$

(5 marks)

(e) Explain briefly **FOUR (4)** main functions of artificial interior lighting.

(10 marks)

Q10 (a) The new world tallest less energy building was built in Jakarta, Indonesia. This building is situated in the city and surrounded by busy transportation network systems. As an acoustic contractor, describe your ideas to reduce and control the noise and vibration of the building. You may sketch out the layout to illustrate your points.

(10 marks)

(b) With the aid of a sketch, describe how permanent supplementary artificial lighting of interiors (PSALI) is used to achieve the desired illuminance.

(15 marks)

- END OF QUESTION -