UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2014/2015

COURSE NAME	:	BUILDING SERVICES II
COURSE CODE	:	BFB 40703
PROGRAMME	:	BACHELOR OF CIVIL ENGINEERING WITH HONOURS
DATE OF EXAMINATION	:	JUNE 2015 / JULY 2015
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES
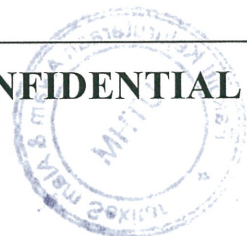
Q1   (a)   What is decibel and briefly describe why sound is measured in units of decibels instead of sound pressure in units of microbars? What is the difference between sound pressure level (SPL) and sound intensity? Is it possible to hear a sound with a negative SPL and why?

(10 marks)

(b)   (i)   The speed of sound in concrete is 3400 m/s. What is the frequency of a sound transmitted through the concrete if the sound wavelength is 500mm? What is the wavelength of a 15,000 Hz sound in water, if the speed of the wave is 1500m/s

(ii) The sound level at a distance of 60 m from the center of roadway is 65 dBA. What is the sound level at a distance of 10 m from the center of the road under the same traffic conditions?

(10 marks)

Q2   (a)   Briefly discuss **FOUR (4)** sources of construction noise and control methods. Describe **THREE (3)** methods of reducing noise at a heavy construction site.

(10 marks)

(b)   A bulldozer is being used to push load a scraper at a construction site. Each machine has an SPL of 95dBA operating alone. What is the SPL of the two machines operating together? What is the combined SPL from three vibratory rollers operating at the same time on a construction site if each one alone has an SPL of 75dBA? What will be the SPL if four identical rollers operate simultaneously?

(10 marks)

Q3   (a)   The noise level is increasing day by day in urban and rural both environments. It is detrimental in many ways and particularly for human health. It causes annoyance, irritation, headache, insomnia, fatigue, mental disorders, and other human ailments. The noise cannot be totally eliminated but can be reduced by adopting certain measures. With appropriate examples, explain the basic principles of noise control for the following strategies:

   (i)   Noise control at source
   (ii)   Noise control along the path
   (iii)   Noise control at receiving end
   (iv)   Other ways of noise control

(10 marks)

      (b)   Transient noise levels due to traffic along a roadway were measured at 10 minutes intervals, and the following individual Sound Level (SL) reading in dBA were taken in sequence: 73, 78, 82, 84, 84, 76, 75, 75, 73, 72, 76, 78, 81, 85, 81, 80, 78, 78, and 74.

   (i)   Compute the L20, L60 and L80 sound levels.
   (ii)   What is the source of most of the noise from automobile traffic and describe how automobile traffic noise can be controlled using noise barriers.

(10 marks)

Q4   (a)   Explain **TWO (2)** advantages of natural lighting compared to artificial lighting. With the aid of drawing explain **THREE (3)** strategies how natural lighting can be fully utilized in minimizing the energy consumption for artificial lighting.

(10 marks)

(b)   Compare the total costs of each lighting systems for a windowless office that need to be illuminated for 15 hours per day, for six days per week for 50 weeks per year. The floor is 20 m long and 12 m wide. An overall illumination of 450 lux is to be maintained over the whole floor. The total light loss factor for the installation is 70%. The designers have the choice of using 100 W tungsten filament lamps, with 12 lumen per watt efficiency and need replacement for every 3000 hours. Another alternative is 65W tubular fluorescent warm white lamps, which have an initial output of 5400 lumen and are expected to provide 12000 hours of service. The room layout requires an even number of lamp. Electricity costs 25 cent per kWh. The tungsten lamps cost RM 2.50 each while the fluorescent tubes cost RM 10.00 each. As the consultant to the office owner, make a recommendation on which system is more preferable and state your reasons.

(10 marks)

Q5   (a)   With the aid of drawing explain what is daylight factor and its components. Explain the simple rule of thumb methods for determining daylight factor and the more detailed formulae method.

(10 marks)

(b)   A 30 m x 20 m size of floor area and 3.5 m height space is designed as a general office. The interior designer decides to paint the ceiling with cream color whereas the walls are to be dark grey. The working table height of the office is at 0.90 meters from the floor level. Two 58 W, 1500 mm fluorescent lamps are to be used with 5100 lumens of Lighting Design Lumen and 0.9 Maintenance Factor. Refer Table Q5(b)(i), Table Q5(b)(ii) and Table Q5(b)(iii) and calculate the numbers of luminaries needed.

(10 marks)

- END OF QUESTION –

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Table Q5(b)(i): Typical value of illuminance

Application	Illuminance (lux)
Emergency Lighting	0.2
Suburban street lighting	5
Dwelling	50 – 150
Corridors	100
General offices	400
Drawing office	600
Prolonged task with small detail	900

Table Q5(b)(ii): Luminance factors for painted surfaces

Surfaces	Typical Colour	Luminance Factors
Ceiling	White, Cream	70 – 80
Ceiling	Sky Blue	50 – 60
Ceiling	Light Brown	20 – 30
Walls	Light Stone	50 – 60
Walls	Dark Grey	20 – 30
Walls	Black	10
Floor		10

Table Q5(b)(iii): Utilization factors for a bare fluorescent tube fitting with two 58 W 1500 mm lamps (%)

Luminance Factors		Room Index								
Ceiling	Wall	0.75	1.00	1.25	1.5	2.00	2.50	3.00	4.00	5.00
70	50	48	53	59	64	71	75	79	83	86
70	30	40	46	51	57	64	69	73	78	82
70	10	35	40	46	51	59	64	68	74	78
50	50	43	48	52	57	63	67	70	74	76
50	30	37	41	46	51	57	62	65	70	73
50	10	33	37	42	46	53	58	61	67	70
30	50	39	42	46	50	55	59	61	65	67
30	30	34	37	42	46	51	55	58	62	65
30	10	30	33	38	42	48	52	55	59	62