Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2023/2024

COURSE NAME	:	BUILDING SERVICES
COURSE CODE	:	BFB41003
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	JULY 2024
DURATION	:	3 HOURS
INSTRUCTIONS	:	1. ANSWER ALL QUESTIONS 2. THIS FINAL EXAMINATION IS CONDUCTED VIA ☐ Open book ☒ Closed book 3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE FINAL EXAMINATION CONDUCTED VIA CLOSED BOOK

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

Q1. (a) Building envelope is crucial for heat transfer, as well as the well-being and comfort of the building's occupants.

(i) Describe **TWO (2)** modes of heat transfer mechanisms that can affect the comfort of the building's occupants in residential areas.

(4 marks)

(ii) Explain **THREE (3)** strategies influencing heat transfer mechanisms to achieve the comfort of the building's occupants.

(6 marks)

(b) Air conditioning can save our lives and keep us comfortable. During periods of intense heat, the use of air conditioning can effectively mitigate the risk of heatstroke by maintaining a cool environment and reducing excessive strain on the body.

(i) Differentiate between **THREE (3)** main factors in the selection of basic and advanced air conditioning systems.

(6 marks)

(ii) An examination hall with a volume of 20,000 m^3 must have its ventilation system set to 4.0 air changes per hour. Assuming a 4.5 m/s air flow rate cap in the supply duct, calculate both the volume flow rate and the dimensions of a square duct for supply air.

(9 marks)

Q2. Psychrometric graphic shows how supply-air factors affect relative humidity. Using this method, a designer or operator can "work backward" from a specified room's relative humidity to the supply duct air condition.

(a) Explain **TWO (2)** ways, how psychrometric charts affect indoor air quality and thermal comfort.

(4 marks)

(b) Psychrometric charts comprise numerous fundamental parameters for understanding and assessing air qualities and behaviour under different situations. Based on the factors in the psychrometric chart, classify **THREE (3)** categories of factors in the psychrometric chart.

(6 marks)

(c) Electricity is a vital component of the modern economy. Electricity fuels several sectors such as industries, enterprises, and infrastructure, facilitating economic expansion and progress.

(i) Differentiate the **THREE (3)** characteristics of series and parallel circuits.

(6 marks)

(ii) Justify **THREE (3)** reasons for selecting a suitable type of circuit for an industrial building.

(9 marks)

Q3. (a) Water supply and discharge systems are essential to buildings and communities, supplying clean water for varied uses and controlling wastewater.

(i) Explain **TWO (2)** positive effects of indirect water supply systems in industrial buildings.

(4 marks)

(ii) Illustrate **THREE (3)** components of the rainwater harvesting system that are sustainable based on the NAHRIM Technical Guide.

(6 marks)

(iii) Differentiate **THREE (3)** characteristics between water supply systems for high-rise buildings and low-rise buildings.

(6 marks)

(b) Based on the KPJ building's gravity water supply in Batu Pahat, the discharge rate of the square-shaped water tank, suction tank, and supply pipe is 2.0 litres per second. The building consists of 2 blocks; each building has 25 rooms and 4 guests in each room. Assume head loss is negligible with a head pressure of 3 m and a length of 15 m. Allow 10% for bends and other unforeseen events. Assume 200 liters of cold water per person for a 24-hour supply interruption and a 12-hour supply disruption, respectively. Calculate the following:

(i) Amount of water required for a 24 hours interruption.
(ii) Amount of water required for a 12 hours disruption.
(iii) Total amount of water requirement in unit cubic meter (m^3).
(iv) Volume of storage tank.
(v) Water is required to be stored in 1 storage tank.
(vi) Size of storage tank for 24 hours + 12 hour disruption.
(vii) Volume of suction tank.
(viii) Water is required to be stored in 1 suction tank.
(ix) Size of suction tank for 24 hours + 12 hour disruption.
(x) Size of supply pipe for discharge (diameter of supply pipe by using Thomas box formula). Amount of water required for a 24 hours interruption.

(9 marks)

Q4. The function of building transportation systems is to facilitate the safe, efficient, and practical movement of people and materials throughout the building.

a) Explain **TWO (2)** building transportation systems that are usually used in airport buildings.

(4 marks)

b) Illustrate **THREE (3)** electric traction passenger lift components.

(6 marks)

c) Differentiate **THREE (3)** characteristics of hydraulic lift and electric traction passenger lift.

(6 marks)

d) Discuss **THREE (3)** factors affecting a building's elevator design for high-rise buildings.

(9 marks)

-END OF QUESTIONS-