Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2023/2024

COURSE NAME	:	BUILDING SERVICES
COURSE CODE	:	BFB41003
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	JANUARY / FEBRUARY 2024
DURATION	:	3 HOURS
INSTRUCTION	:	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 EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1. (a) In the city of Kuala Lumpur, an office building with a glass wall and a steel frame is planned. Other residential buildings surround the structure. To keep the indoor environment cool during the day, a mechanical air conditioning system is required.

(i) Explain **THREE (3)** modes of heat transfer mechanisms as they pertain to the medium of transmission with the aid of sketch.

(6 marks)

(ii) Explain **TWO (2)** factors influencing heat transfer mechanisms for each 3 answers in **Q1**(a)(i).

(6 marks)

(b) Air conditioning is essential for indoor comfort, especially in hot, humid climates.

(i) Explain **THREE (3)** main reasons for using air conditioning, which can be good for the people who live or work in a building, especially in places with hot and humid areas.

(7 marks)

(ii) A residence that has a volume of 1200 m^3 needs to have its ventilation system set to a rate of 3.3 air changes per hour. Calculate the volume flow rate as well as the dimensions of a square duct for supply air based on the assumption that the air flow rate in the supply duct is capped at 4 m/s.

(6 marks)

Q2. (a) The psychrometric chart is a valuable tool in the fields of HVAC (Heating, Ventilation, and Air Conditioning) and building design.

(i) Explain **TWO (2)** significances of the psychrometric chart in the field of HVAC (Heating, Ventilation, and Air Conditioning) in building design.

(4 marks)

(ii) Based on Psychrometric Chart as shown in **Figure APPENDIX A.1**, determine the values of the remaining **FOUR (4)** parameters at dry bulb temperature of 20 °C and moist bulb temperature of 10 °C.

(8 marks)

(b) You are appointed as a building services engineer in a 50-storey office building to ensure electrical safety within the building. The facility will involve various electrical components and machinery, and safety is a top priority. As you plan and implement the electrical infrastructure:

(i) Explain **FIVE (5)** components that represent various types of safety in electrical work.

(10 marks)

(ii) Explain **ONE (1)** difference of the features of a series circuit and a parallel circuit.

(3 marks)

Q3. (a) The water supply and discharge system refers to a plumbing infrastructure that facilitates the provision of clean water to a building for a range of purposes, including drinking, washing, and sanitation.

(i) Discuss **TWO (2)** negative effects of direct and indirect water supply system in high-rise building.

(5 marks)

(ii) Suggest **TWO (2)** sustainable and efficient water supply strategies that can be used during water crisis.

(5 marks)

(iii) Based on a hotel's gravity supply, the discharge rate of the square-shaped water tank, suction tank, and supply pipe is 1.25 liters per second. The hotel consists of 2 building blocks, each building have 50 rooms and 4 guests in each room. Assume head loss is negligible with 6 m head pressure and length of pipe is 30m allow 20% for bends. Assume 180 liters of cold water per person for a 24-hour supply interruption and a 12-hour supply disruption. Calculate:

i. Amount of water required for 24 hours interruption.
ii. Amount of water required for 12 hours disruption.
iii. Total amount of water requirement in unit cubic meter (m^3).
iv. Volume of storage tank.
v. Water required to store in 1 storage tank.
vi. Size of storage tank for 24 hours + 12 hour disruption.
vii. Volume of suction tank.
viii. Volume of water in unit cubic meter (m^3) required to store 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).

(15 marks)

Q4. (a) The function of building transportation systems is to facilitate the safe, efficient, and practical movement of people and products throughout the structure.

(i) List **FIVE (5)** building transportation systems.

(5 marks)

(ii) Discuss **TWO (2)** functionality of each transportation system you listed in **Q4(a)(i)**.

(5 marks)

(iii) Sketch **FIVE (5)** hydraulic lift components.

(10 marks)

(iv) A variety of criteria dictate the number of elevators in a structure as well as their overall size. Explain **TWO (2)** factors that go into the planning and layout of a building's elevators.

(5 marks)

-END OF QUESTIONS-

APPENDIX A

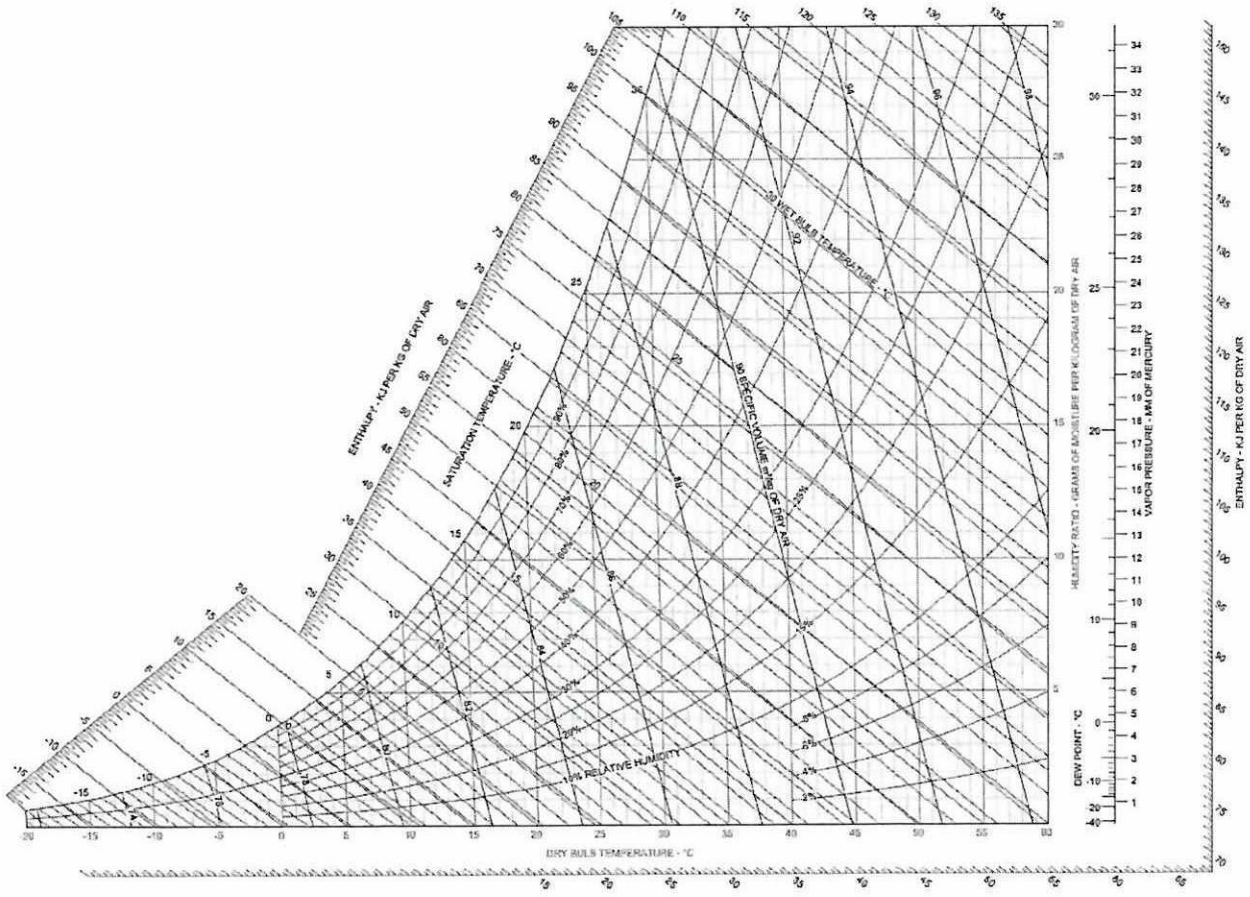

Figure APPENDIX A.1