



GENERAL SIR JOHN KOTELAWALA DEFENCE UNIVERSITY  
FACULTY OF TECHNOLOGY  
INTAKE 39

04<sup>th</sup> SEMESTER EXAMINATION

BET (HONS) IN BUILDING SERVICE TECHNOLOGY DEGREE PROGRAMME  
HEATING, VENTILATION, AIR CONDITIONING AND REFRIGERATION SYSTEMS  
(ETBC2214)

Time Allowed: 3 Hours

23<sup>rd</sup> October 2023

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**INSTRUCTIONS TO CANDIDATES**

This paper contains **five questions** in three pages.

Answer **all** the questions.

Marks for each question is indicated in the question itself.

This is a closed book examination

This examination accounts for 60% of the module assessment. The total maximum mark obtainable is 100. The marks assigned for each question and parts thereof are indicated in square brackets

If you have any doubt as to the interpretation of the wordings of a question, make your own decision, but clearly state it on the script

Assume reasonable values for any data not given in or provided with the question paper, clearly make such assumptions made in the script

All examinations are conducted under the rules and regulations of the KDU

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**Question 1****[20 marks]**

The term 'refrigeration' may be defined as the process of removing heat from a substance under controlled conditions.

- a) Explain the functions of basic components of a vapour compression refrigeration cycle. Indicate the assumptions made by you clearly and draw the necessary schematic diagram of the refrigeration cycle. [10 marks]
- b) Discuss the process of heat removal from a required space using a vapour compression refrigeration cycle. [10 marks]

**Question 2****[20 marks]**

- a) Describe the terms Refrigeration effect, Compressor work and Coefficient of performance in a refrigeration and Air conditioning cycle. [12 marks]
- b) Develop the equations to determine the amounts of above three components of a refrigeration plant, using the enthalpy differences and refrigerant mass flow rate. [08 marks]  
(Draw necessary diagrams and indicate assumptions made by you clearly)

**Question 3****[20 marks]**

Maintaining desirable internal air for human comfort is necessary with the changing outside environmental conditions.

- a) Briefly describe the four major factors affecting comfort air conditioning [10 marks]
- b) Identify the 'factors affecting human comfort' and illustrate the 'comfort zone' in central air conditioning, using a suitable diagram. [10 marks]

**Question 4****[20 marks]**

Energy efficiency in building services technology is an important consideration, not only with HVAC & R plants, but also with outside climate conditions.

Evaluate the significance of 'accurate calculation of following calculations.

- a) Cooling load of a room/space in a hot summer climate. [10 marks]
- b) Heat load calculation for the winter season. [10 marks]

**Question 5****[20 marks]**

- (a) Discuss the importance of maintenance and keeping the operational capability of HVAC plants to ensure human comfort continuously. [08 marks]
- (b) 'In the winter, heat loss from the room, at any instance, is equal to the heat load at that time. In the summer, the amount of heat received at a given time is not always equal to the amount of heat rejected by the plant at that time'. Justify the above statement by explaining 'Heat storage and time lag effect' [12 marks]

**END OF THE QUESTION PAPER**

