JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

UNIVERSITY EXAMIMATION FOR THE DEGREE IN SCIENCE IN CONSTRUCTION MANAGEMENT

2ND YEAR 2ND SEMESTER 2023/2024 ACADEMIC YEAR

CENTRE: MAIN CAMPUS

COURSE CODE: TCB 1208

COURSE TITLE: BUILDING SERVICES I

EXAM VENUE: **STREAM: BSc. CONSTRUCTION MGT**

DATE: /04/2024 **EXAM SESSION:**

DURATION: 2 HOURS

Instructions

1. **Answer question 1 (Compulsory) and ANY other two questions**
2. **Candidates are advised not to write on question paper**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

Question One (Compulsory) (30 Marks)

(a) Define psychrometry and state five properties of air and their meaning. **[6 Marks]**

(b) Explain briefly the term psychrometrics, psychrometry chart and its two uses **[6 Marks]**

(c) A sample of air has dry and wet-bulb temperatures of 35°C and 25°C respectively. The barometric pressure is 760 mm Hg. Calculate without using psychrometric chart: **[4 Marks]**

(i) Humidity ratio,

(ii) relative humidity and

(iii) enthalpy of the sample.

(d) In order to condition air to the conditions of human comfort, certain basic processes are to carried out on the outside air available**.** List six basic psychrometric processes properties of air and briefly explain any three of these basic psychrometric process's properties. **[6 Marks]**

(e) There is much more to human comfort than just temperature. List and briefly describe each of the four critical factors that determine human comfort inside the buildings. **[8 Marks]**

Question Two (20 Marks)

(a) In the context of mechanical building services, heating, ventilation and air conditioning (HVAC) systems is the common terminology, but indoor control systems is the more accurate and inclusive of all the functions of air conditioning. Very briefly explain the term internal environment control systems (IECS) refer to in mechanical building services? **[2 Marks]**

(b) People in town settings spend between 80% to 90% of their valuable time in indoor spaces both during work and during leisure time. It is therefore crucial that architects and mechanical, electrical and plumbing (MEP) engineers work together to ensure the quality environment. Outline five considerations that results in good building design. **[5 Marks]**

(c) Heating ventilation and air conditioning (HVAC) systems account for nearly 40% of the energy used in commercial and institutional buildings. The condition of your building envelope strongly influences HVAC systems energy consumption and occupants' comfort. Outline seven essential strategies are used in buildings to conserve energy. **[13 Marks]**

Question Three (20 Marks)

(a) The term comfort air conditioning encompasses all the conditioning processes applied to

ambient air to obtain an indoor environment that is comfortable. Outline each the four of important requirements for comfort air conditioning, give their acceptable values. **[5 Marks]**

(b) With the help of a well labelled diagram explain the basic operation of a simple vapour compression refrigeration cycle serving an air conditioning system. **[10 Marks]**

(c) With help of a labelled diagram outline six steps of an air conditioning cycle. **[5 Marks]**

Question Four (20 Marks)

(a) Explain briefly the term ventilation and its two important purposes. **[3 Marks]**

(b) Differentiate between natural ventilation and mechanical ventilation systems. **[5 Marks]**

(c) With the help of a diagram explain the working of a typical ventilation system. **[6 Marks]**

(d) A lecture theatre has dimensions 25 m×22 m×6 m high and has 100 occupants; 8 l/s of fresh air and 25 l/s of recirculated air are supplied to the theatre for each person. A single duct ventilation system is used. If 10% of the supply volume leaks out of the theatre, calculate the room air change rate and the air volume flow rate in each duct. **[6 Marks]**

Question Five (20 Marks)

(a) State the primary purpose of a plumbing system. What does this entail? **[3 Marks]**

(b) Outline the main objectives in designing a water supply system in a building. **[3 Marks]**

(c) With the aid of a sketch explain how cold-water supply get to a newbuilding? **[4 Marks]**

(d) A residential storey building having 24 floors and each floor consists of 4 flats: 2 of them having 3 bedrooms, 2 of them having 2 bedrooms, plus 1 bed sitter in each flat. Calculate the daily water requirement in the building in cubic metres per day. **[6 Marks]**

(e) Explain briefly the main objective and function of a drainage system in a building. How is the removal of waste water and waste done and carried out in the drainage system?**[4 Marks]**