JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

UNIVERSITY EXAMINATIONS FOR THE DEGREE IN SCIENCE IN CONSTRUCTION MANAGEMENT

2ND YEAR 1ST SEMESTER 2017/2018 ACADEMIC YEAR

CENTRE: MAIN CAMPUS

COURSE CODE: TCM3214

COURSE TITLE: BUILDING SCIENCE

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

DATE: 19/12/2017 **EXAM SESSION: 2.00 – 4.00PM**

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**

1. a) State the laws of thermodynamics and explain the relevance of each law to heat flow in a building as an envelope. (6 marks)

   b) Describe the designer's task as pertains to heat flow in a building. (8 marks)

   c) Define

      i) Specific heat capacity and state its units. (2 marks)

      ii) How long will it take 1000 liters of water at room temperature and pressure of 24°C to bring it to boiling point under the same conditions, using an immersion heater of 1500 watts?

      (take the heater efficiency at 95% and the specific heat capacity of water at 4176 J/Kg. K) (5 marks)

   d) Given the outside temperature T_o as 18°C and the internal temperature T_i as 24°C over a 15m^2 wall of brick work whose conductivity(U) is 1.5w/m^2K. Calculate the heat flow rate under the stated conditions. (5 marks)

   e) State the conditions under which stack effect takes place. (4 marks)

2. a) Describe a "free field" as applied to sound propagation (2 marks)

   b) Discuss any TWO sound insulating properties of a partitioning or a dividing wall in a building (4 marks)

   c) Explain the THREE main sources of environmental noise (6 marks)

   d) List any TWO sound absorbers used in a building. (2 marks)

   e) With the aid of sketches explain the difference between acoustic shadow and diffraction as used in sound propagation. (6 marks)

3. a) Explain any FOUR (4) reasons for ventilating a building. (4 marks)

   b) A large hall 25 m in length and 20 m width has a ceiling of 9 m the building requires mechanical ventilator. Determine the air flow rate in the system?

      Use the following data:

      Occupancy: 600 seats

      Supply air ventilation rate: 10 air changes per hour.

      Recommended outdoor rate for room with some smoking 8 l/s/p (7marks)

c) Outline the THREE advantages of natural ventilation system (3 marks)

d) With the aid of diagrams explain:-

i) Cross flow ventilation

ii) Single sided ventilation (6 marks)

4. a) Outline the THREE factors of thermal comfort in a building (6 marks)

b) Explain the green house effect (4 marks)

c) Briefly describe the attributes of light. (4 marks)

d) Define the following terms as used in light.

i) Hue

ii) Value

iii) Chroma. (6 marks)

5. a) Describe the techniques which are used to provide natural ventilation in a building. (6 marks)

b) An opal diffuser luminaire is mounted at 1.75m above the work plane, with its axis vertical and the illuminance at 1m to one side of the aiming point is to be found. I = 230cd (6 marks)

c) The heat flow through a 3 m by 4 m piece of plywood wall is 667 BTU (British Thermal Unit) per hour. The temperature on one side of the wall is 65 °F and the temperature on the other side is 30°F. The plywood is 1.5mm thick. Calculate the R-value of the plywood. (3 marks)

d) Using a suitable sketch, illustrate heat exchange processes between a building and the external environment (5 marks)