



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

**UNIVERSITY EXAMINATION FOR:
DIPLOMA IN ARCHITECTURE (DA 13S)**

EAR 2203: BUILDING ENVIRONMENTAL SCIENCE - THERMAL DESIGN

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: AUGUST 2016

TIME ALLOWED: 2 HOURS

TIME: 1SEP2016

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *Non-programmable Scientific Calculator*

This paper consists of **FIVE** questions. Answer any **THREE** questions of the **FIVE** questions

All questions carry equal marks

Maximum marks for each part of a question are as shown

Use neat, large and well labeled diagrams where required.

This paper consists of **THREE** printed pages

Mobile Phones are not allowed inside the examination room

Do not write on the question paper

Question One

- a) Give an account of the THREE ways in which the earth-sun relationship affects the amount of radiation received by a particular point on the earth's surface. **(10 marks)**
- b) Man-made environment can create micro-climate of their own deviating from the macro-climate of a region to a degree depending on the extent of man's intervention. Elaborate. **(10 marks)**

Question Two

- a) Distinguish the following terms as used in Building Environmental Science:
 - (i) Climate **(2 marks)**
 - (ii) Weather **(2 marks)**
- b) Thermal comfort differs from one individual to another. Highlight FIVE variables that exhibit thermal preference(s) as a subjective concern. **(10 marks)**
- c) Explain the heat exchange between a clothed body and its physical environment. **(6 marks)**

Question Three

- a) Differentiate the following terminologies: **(4 marks)**
 - (i) Comfort-zone
 - (ii) Thermal balance
- b) Identify three forms of radiation according to human perception **(6 marks)**
- c) Discuss thermal balance with regard to climatology **(5 marks)**
- d) The aspect ratio of a symmetrical street canyon is an important feature of the urban geometry which has a considerable effect on the thermal climate at street level. Demonstrate this by use of an illustration. **(5 marks)**

Question Four

- a) When the zone of inevitable body heating is reached the interior body temperature rises sharply. Explain THREE physiological hazards that may occur due to this. **(5 marks)**
- b) State THREE factors in each case below:
 - (i) The main functions served by ventilation **(3 marks)**
 - (ii) Why ventilation for health is necessary **(2 marks)**
- c) Describe the process by which the body produces heat **(5 marks)**
- d) Discuss topography with regard to climatology **(5 marks)**

Question Five

- a) One of the factors that shapes the climate on the earth's surface is wind. Explain. **(5 marks)**
- b) Discuss weather elements as a factor(s) of climatology **(5 marks)**
- c) In order to achieve a convenient thermal sensation, sometimes the body has to lose heat to the environment, and in other times it has to gain heat from the surroundings by different means. Outline the following two modes:
- (i) Convective heat exchange **(5 marks)**
 - (ii) Evaporative heat exchange **(5 marks)**