

**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
FACULTY OF ARCHITECTURE AND QUANTITY SURVEYING

**DEPARTMENT OF ARCHITECTURE**  
BACHELOR OF ARCHITECTURE (HONOURS) DEGREE

PART II FIRST SEMESTER EXAMINATIONS – DECEMBER 2002  
**AAR 2104 Environmental Design I**

*Answer Question 1 and four (4) other questions only.*  
*hours*

*Time: 3*

**QUESTION 1**

Thermal Indices may be used as an environmental tool to assess the climate of a site, once the climatic parameters of air temperature, wind velocity, relative humidity, as well as the comfort limits of the site, are known. Describe one method that you have learnt, using the Thermal Index known as Effective Temperature for analyzing the climate of a city, and indicating the equipment/materials to be used.

*(20 marks)*

**QUESTION 2**

(a) What is meant by orientation of a building and how can it influence the indoor thermal environment? *(5*  
*marks)*

(b) Describe the characteristics of an urban area that are instrumental in causing deviation from the localized macro-climate.  
*(15 marks)*

**QUESTION 3**

Glass has become an important material in modern building, but its unique property of differential transparency to radiation requires that it be used with caution. Describe this particular property of glass, and explain its significance for thermal control in buildings. Evaluate the various types of glass/glass treatments used to limit heat penetration into buildings.

*(20 marks)*

**QUESTION 4**

The choice of building materials, especially for the external building envelope, greatly affects the flow of heat into buildings. Describe the thermophysical properties of building materials that are important to their thermal performance in buildings. Discuss the significance of climate in relation to the correct use of building materials in Zimbabwe.

*(20 marks)*

**QUESTION 5**

Discuss, with sketches, the four (4) major factors that influence the micro-climate of a site: sun motion, topography, surface characteristics, and physical structures. Comment on the micro-climate of Bulawayo, Zimbabwe, in relation to these four factors.

*(20 marks)*

**QUESTION 6**

(a) Explain the following terms used in lighting studies - diagrams are necessary:

- |                    |                         |
|--------------------|-------------------------|
| (i) luminous flux  | (ii) luminous intensity |
| (iii) illumination | (iv) luminance.         |

***12 marks***

(b) Apart from quantity of lighting, the quality of light in a building is also importance. Discuss the requirements of good lighting in buildings, particularly in buildings in tropical conditions.

***(8 marks)***

**QUESTION 7**

Explain the following terms as used in architectural acoustics - diagrams are necessary:

- (i) reverberation time
- (ii) sound absorbers
- (iii) impact noise and vibration
- (iv) acoustical defects.

***(20***

***marks)***