

AR117 - Building Science

Date: Monday 27th May, 2024
Time: 8.20am
Room: Architecture Studio 1
Duration: 3 hours

Instruction to Candidates:

- 1.0 You have 10 minutes to read the paper.
You must not begin writing during this time.
- 2.0 All answers must be written on the answer book(s) provided
- 3.0 Print your name and student identification number on the answer book(s) provided. Do it now.
- 4.0 No reference material is allowed in the examination room.
- 5.0 No mobile phones allowed in the Examination Room. Alternatively, switch off and put in your bag and leave at the front of the room.
- 6.0 Attempt All Questions

Question No.1 (3 marks)

The sun is the dominant factor which affects climate. Explain the relationship between climate, man, and buildings.

Question No.2 (2 marks)

There are many reasons why man is compelled to build, but there are at least 2 fundamental reasons why he does so. Identify and briefly explain these 2 reasons.

Question No.3 (3 marks)

The tropics is defined by the tropic of Cancer and the tropic of Capricorn.

- (a) Correctly identify these two demarcations by their latitudes.
- (b) In December each year the sun is travelling along which latitude.

Question No.3 (17 marks)

- (a) Define thermal comfort (2 marks)
- (b) List the thermal comfort factors (15 marks)

Question No.4 (2 marks)

Explain these concepts:

- (a) Thermal conductivity (k-value)
- (b) Thermal resistivity
- (c) Transmittance (U-value)

Question No.5 (12 marks)

Provide correct equations for:

- (a) Conduction heat flow rate, Q_c (4 marks)
- (b) Ventilation heat flow rate. Q_v (4 marks)
- (c) Solar radiation through glass window, Q_s (4 marks)

Question No.6 (10 marks)

The thermal balance equation is given as follows:

$$Q_i + Q_s \pm Q_c \pm Q_v \pm Q_m - Q_e = 0$$

- (a) Correctly identify each of the variables given in the equation above.
- (b) Briefly describe the building design objectives for: (i) the heat loss situation, and (ii) for the heat gain situation

Question No.7 (4 marks)

Define the following terms:

- (a) Luminous Flux
- (b) Luminous Intensity
- (c) Luminance
- (d) Illuminance

Question No.8 (8 marks)

- (a) Describe the objectives for lighting (3 marks)
- (b) Explain the difference between a lamp and a luminaire (2 marks)
- (c) Briefly describe the 3 layers of lighting (3 marks)

Question No.9 (8 marks)

- (a) Why do we use the Lumen Method (2 marks)
- (b) Write the equation for determining the Lumen Method. Ensure to identify all variables in the equation (6 marks)

Question No.10 (3 marks)

In large auditoriums, a raked or terraced seating arrangement is preferred. Explain why this is the case.

Question No.11 (3 marks)

External noise control can be addressed by adopting a number of strategies. Identify and describe three (3) of these strategies'

Question No.12 (2 marks)

What are the uses of the following products in addressing a noise problem:

- (a) The use of a Roxul batt insulation,
- (b) The use of a resilient channel