

B.Arch. Examination, 2025
(5th Year, 1st Semester)

BUILDING SCIENCE & SUSTAINABILITY

Full Marks: 100

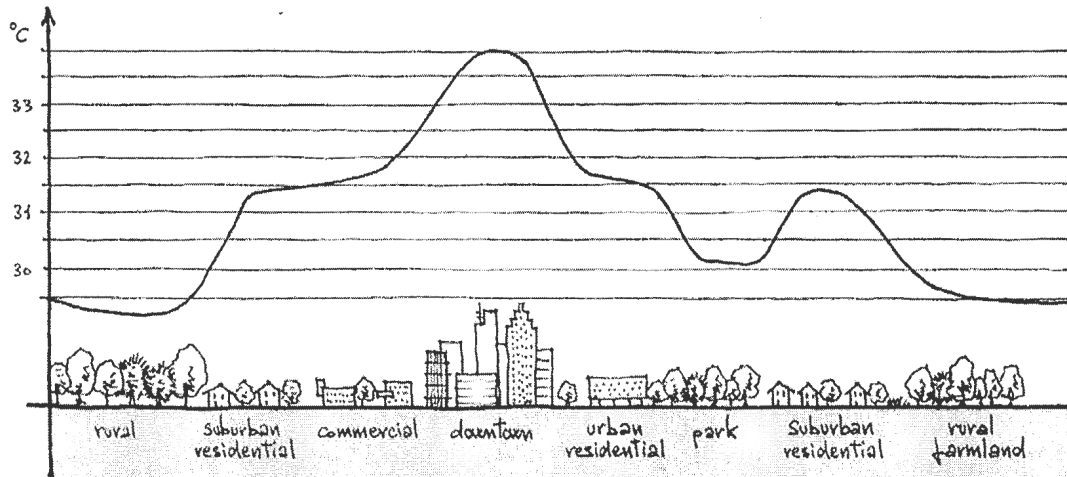
Time: 3 Hours

The figures in the margin indicate full marks

Question No.8 is compulsory and answer any 5 from remaining Questions

Q1.

- i. Briefly explain the concept as shown in the image and its relevance in Climate Studies. (5 marks)



- ii. Briefly explain the Goal 11 & 13 of SDG 2030, and their significance. (5 marks)
iii. Briefly explain the salient features of India Cool Action Plan 2019. (5 marks)

Q2.

- i. Explain the concept of sensible heat and latent heat with respect to passive design strategies in sustainable building design? Make necessary sketches. (10 marks)
ii. Briefly explain the strategies to reduce heat gain inside a building through conduction. (5 marks)

Q3.

- i. A brick wall of 250mm thick has a thermal conductivity of $0.821 \text{ W/m}^\circ\text{C}$. The outer and inside surface conductance of the walls is $12 \text{ W/m}^2\text{C}$ and $6 \text{ W/m}^2\text{C}$ respectively. Find the U-value of the wall in $\text{W/m}^2\text{C}$. (5 marks)
ii. Explain the concept of U-value and its importance in passive design with respect to Rat Trap Bond and Light Gauge Framed Steel Structure. (5 marks)
iii. A composite wall consists of 3 layers. Brick layer 200mm thick (conductivity= 0.72 W/mK), Insulation of 100mm thick (Conductivity= 0.035 W/mK) and plasterboard of 15mm thick (conductivity= 0.25 W/mK), Given internal resistance= 0.13 mK/W and External Resistance 0.04 mK/W . Calculate the U-value of the composite wall. (5 marks)

[Turn over

Q4.

- i. What is the difference between Daylight Factor and Daylight Autonomy? (5marks)
- ii. From the given values, calculate Daylight Autonomy (DA₄₀₀, DA₂₀₀ and DA₁₀₀) (5 marks)

Time	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm
Lux	50	150	325	700	800	850	500	225	175	25

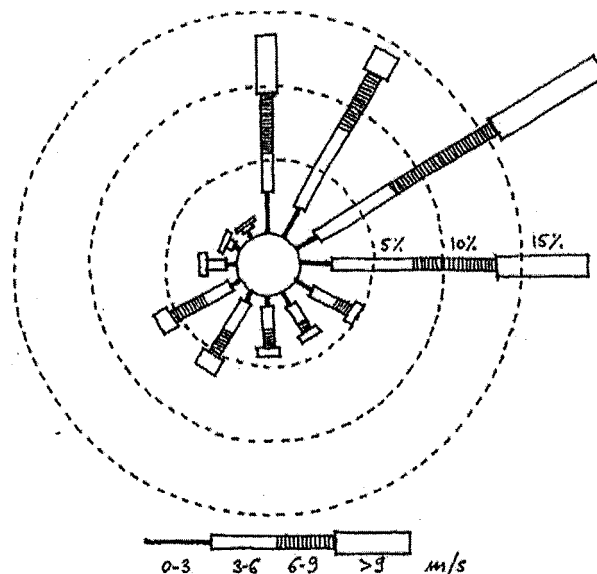
- iii. Also Calculate Continuous Daylight Autonomy cDA₄₀₀, cDA₂₀₀ and cDA₁₀₀ for the same values. (5 marks)

Q5. i. Briefly explain various concepts of induced Ventilation in buildings, with sketches. (10 marks)

- ii. In a small office, the internal temperature is 30 deg C and outside temperature is 20 Deg C. The height difference between the lower and upper opening is 5m, each opening has an area of 0.8 m². Calculate the volumetric air flow rate due to stack effect. (5marks)

Q 6.

- i. Explain the concept of 1 Met and 1 Clo in thermal comfort studies (5 marks)
- ii. Explain the concept of any two Thermal comfort indices and their significance (5 marks)
- iii. Name the Figure below and its importance in passive design strategies. (5 marks)



Q7. i. Explain the concept of Heliostat in daylighting with Sketches and its role lighting. (5 marks)

- ii. What are the strategies to reduce glare in buildings, explain with reference to some architects and the building designed by them? (10 marks)

- Q8. i. Calculate the shading devices for the west and South Window of a width 1500mm and height 1800mm and as per the given values in Table below. **(10 marks)**

West	12pm	1pm	2pm	3pm	4pm	5pm
Azimuth	136	250	260	274	282	288
Altitude	84	76	64	50	36	24
South	12pm	1pm	2pm	3pm	4pm	5pm
Azimuth	136	250	260	274	282	288
Altitude	84	76	64	50	36	24

- ii. Given below is a figure of Givoni's Bioclimatic Chart.

Based on it answer the following questions.

- a) Identify the given numbers(2,3,4,5,6) in the figure and their significance. **(5 marks)**
 (1-comfort zone is given for Reference)
- b) What Passive Design strategies would you suggest for thermal comfort, if Zone 5 is significant from climate data for any location. **(10 marks)**

Givoni's bioclimatic chart

