

B.Arch. Examination, 2022-23
(5th Year, 1st Semester) (Supplementary Exam 2023)

BUILDING SCIENCE & SUSTAINABILITY

Full Marks: 100

Time: 3 Hours

The figures in the margin indicate full marks

Question No. 9 is compulsory and answer any 5 from remaining Questions

Q1.

- i. Explain the climate change Action plans in India since 2008 (5 marks)
 ii. Briefly explain the SDG 2030 and their significance. (10marks)

Q2.

- i. A brick wall of 210mm thick has a thermal conductivity of $0.921 \text{ w/m}^0\text{c}$. The outer and inside surface conductance of the walls is $14 \text{ w/m}^2\text{c}$ and $7 \text{ w/m}^2\text{c}$ respectively. Find the U-value of the wall in $\text{w/m}^2\text{c}$.? (10 marks)
 ii. What do you understand by U-value of a material and how is it different from thermal conductance. (5 marks)

Q3.

- i. Differentiate between thermal conductivity and thermal conductance. (5 marks)
 ii. Explain the concepts of Thermal Mass and PCM materials with respect to sensible heat and latent heat transfer. Make sketches if necessary (10 marks)

Q4.

- i. Differentiate between Luminous Flux and Luminous intensity? (5marks)
 ii. From the given values, calculate Daylight Autonomy (DA_{600} , DA_{300} and DA_{100}) (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 cDA_{600} , cDA_{300} and cDA_{100} for the same values. (5 marks)

- Q5. i. Briefly explain various concepts of induced Ventilation in buildings, with sketches. (5 marks)
 ii. Calculate the Air Flow Rate $V \text{ (m}^3\text{/s)}$ due to stack effect in a room with given information.
 Given: Area of Inlet= 0.6m^2 , Area of outlet = 1.2m^2 , Height between the Centre of inlet and outlet is 2.5m, the inside temperature = 28°C , outside temperature is 26°C . Also if the ratio between the inlet and outlet opening is 2, the increase in air flow rate is 27%. (10 marks)

Q 6.

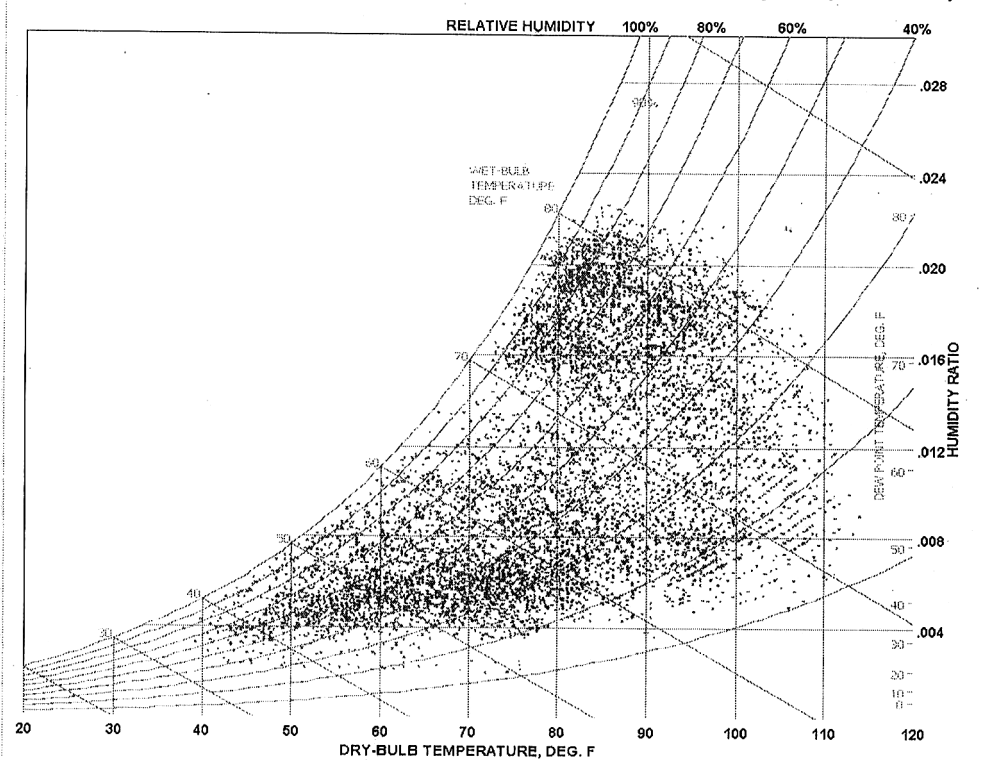
- i. Explain Mean Radiant Temperature and its importance in thermal comfort study? (5 marks)
 ii. Explain the concept of Tropical Summer Index and Corrected Effective Temperature in Thermal comfort Study and their significance (10 marks)

[Turn over

- Q7. i. Explain the concept of VALRA (Variable Area Light Reflecting Assembly) with sketches and its role in daylighting. **(5 marks)**
 iii. What are the strategies to reduce glare in buildings? **(10 marks).**
- Q8. 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. **(15 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

- Q9. As per the data given in the Psychrometric Chart (Fig 1 below) explain the Passive design strategies you would propose for sustainable building design. Make necessary sketches to explain. The green dots signify the 8760 hrs of climate data of a region. **(25 marks)**



Note: Fig: 1 - Chart to refer for Question No. 9