

B.Arch. Examination, 2023-24

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

Q2.

- i. Explain the strategies to reduce the heat gain inside building through conduction, convection and radiation? (9 marks)
- ii. What do you understand by U-value of a material and how is it different from thermal conductance. (6 marks)

Q3.

- i. A brick wall of 250mm thick has a thermal conductivity of $0.821 \text{ w/m}^0\text{c}$. 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 $\text{w/m}^2\text{c}$. (10 marks)
- ii. A wall of width 10m and height 8m is made from 0.25m thick brick with $k= 0.7\text{W/mK}$. The surface temperature on the inside wall is 26^0 C and on the outside is 10^0 C . Find the heat transfer through the wall. (5 marks)

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. (5 marks)

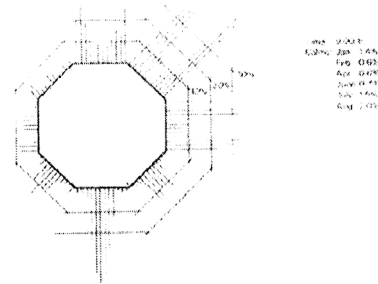
- ii. Calculate the Air Flow Rate $V \text{ (m}^3\text{/s)}$ due to stack effect in a room with given information.
Given: Area of Inlet= 0.6m^2 , Area of outlet= 1.2m^2 , Height between the Centre of inlet and outlet is 2.5m, the inside temperature = 28^0C , outside temperature is 26^0C . Also, given 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 the concept of PMV, PPD and PET in thermal comfort studies (5 marks)
- ii. Explain the concept of any two Thermal comfort indices and their significance (5 marks)

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- iii. Explain the given Diagram with all the information in it. What is the role of this diagram in climate studies. (5 marks)

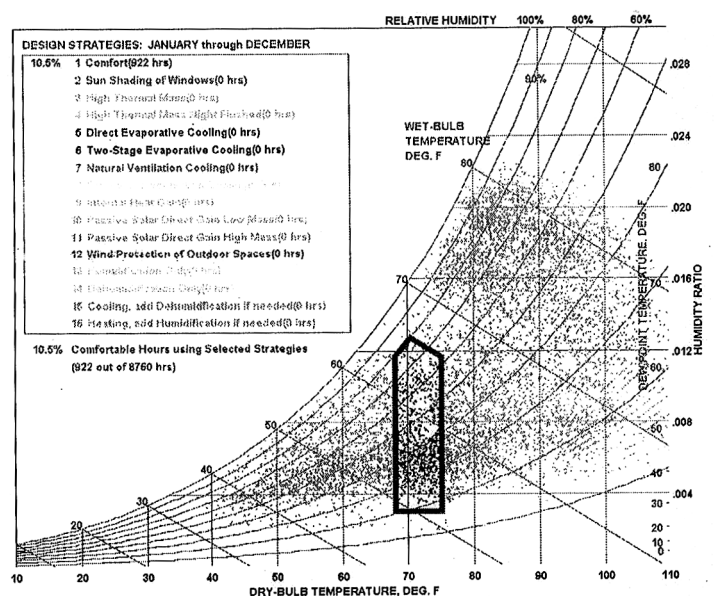


- Q7. i. Explain the concept of Heliostat in daylighting with Sketches and its role in daylighting. (5 marks)
 ii. What are the strategies to reduce glare in buildings? (10 marks).

- Q8. 1. 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

2. 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. (15 marks)



Note: Fig: 1 - Chart to refer for Question No. 8 (part 2)