

Unit III

No. of Printed Pages : 07

Roll No.

5. An existing low rise office building in New Delhi is not provided with any thermal insulation for roof and wall and simple plane single pane glass is used in the windows, it is decided to make the office building compliant with Energy Conservation Building Code (ECBC) of India. Discuss with illustration the steps you would take to retrofit the office building by adding thermal insulation to roof and walls, change glazing and shading devices to make it compliant with (ECBC) using prescriptive path provisions as given below :

Climate type	Maximum U-factor of the overall assembly (W/m ² K)		Minimum R-value of insulation alone (m ² K/W)		Maximum U-factor (W/m ² K)	Maximum SHGC of vertical fenestration
	Roof	Wall	Roof	Wall	Vertical fenestration	WWR
Composite	0.409	0.440	2.1	2.1	3.3	0.25
Hot and Dry	0.409	0.440	2.1	2.1	3.3	0.25

M-AA-263

4

AA-263

M. Arch. EXAMINATION, May 2018

(First Semester)

(Re-appear Only)

SUSTAINABLE ARCHITECTURE

MARC607

Climate Responsive Architecture in Tropics

Time : 3 Hours]

[Maximum Marks : 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. All questions carry equal marks. Use illustrations wherever required.

(2-25/17) M-AA-263

P.T.O.

Unit I

1. Write short notes on any *three* of the following :
 - (a) Warm humid climate
 - (b) Dry bulb temperature and wet bulb temperature
 - (c) Pyranometer
 - (d) Test Reference Year (TRY). **5+5+5=15**
2. How climatic factors for design of buildings in tropical climate of India can save energy and environment, discuss with an example of traditional building ? **15**

Unit II

3. Climatic data of Trivandrum (latitude 8°28' N, longitude 76°56' E) is given in the table, draw the comfort zone for the hottest month and overlay twelve month climate lines on psychrometric chart. Draw the respective control potential zone of the passive strategy to achieve comfort. **15**

Data	Mean max DBT °C	Mean min DBT °C	Mean max RH %	Mean min RH %
Jan.	30.5	23.7	89	56

Feb.	31.8	24.2	90	58
Mar.	32.2	25.4	87	55
Apr.	32.2	26.3	90	63
May	31.5	26	91	67
June	28.6	24.9	92	78
July	28.4	24	94	75
Aug.	29.1	24.2	94	72
Sept.	29.5	24.1	94	67
Oct.	28.8	24.1	95	75
Nov.	29.6	24	93	68
Dec.	30.2	24.1	92	68

4. (a) What are the physiological and environmental factors of thermal comfort ?
- (b) Illustrate comfort zone on bioclimatic chart given by Victor Olgyay.

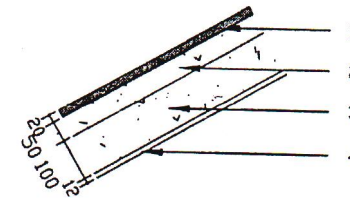
7.5+7.5=15

Warm and

Humid	0.409	0.440	2.1	2.1	3.3	0.25	0.20
Moderate	0.409	0.440	2.1	2.1	6.9	0.40	0.30
Cold	0.409	0.352	2.1	2.35	3.3	0.51	0.51

6. (a) What is the purpose of evaporative cooling and how provisions can be made for the same in buildings ?
- (b) Calculate air-to-air thermal transmittance (U-value) and give its unit for the given construction.

Roof Section



Layer	Thickness	Conductivity	Resistance
resistance	(b) M	(k) W/mK	(R) m ² K/W
1. Outside	—	—	0.044
film (Ro)			
2. Terra-cotta (R1)	0.020	1.21	

(2-25/19) M-AA-263

5

P.T.O.

3. Lime concrete (R2)	0.50	0.730	
4. Reinforced concrete (R3)	0.100	1.58	
5. Cement plaster (R4)	0.012	0.721	
6. Inside film (Ri)	–	–	0.105
Total Resistance	$R=R_0+R_1+R_2+R_3+R_4+R_i$		
U value (1/R)			

Unit IV

7. (a) What is a sun path diagram ? Illustrate the summer solstice, equinox and winter solstice on the sun path diagram.
- (b) Why solar control is essential in building ? Illustrate application of three types of fixed external shading devices : horizontal, vertical and egg crate.

$$7.5+7.5=15$$

8. Architect Ludwig Mies Van der Rohe adopted motto “*less is more*” to describe his aesthetic tactic of arranging the numerous necessary components of a building to create an impression of extreme simplicity. In the light of this statement discuss typology of high performance glasses. What is the limit of WWR given by the Energy Conservation Building Code of India ?

15