

Effective Temperature Difference (ETD) for roof : 28°C  
 U- value for glass: 3.5w/m<sup>2</sup>.K  
 Solar Heat Gain(SHG) of glass: 250 W/m<sup>2</sup>  
 Internal Shading Co-efficient (SC) of glass: 0.9  
 Infiltration: 0.6 air changes per hour barometric pressure: 101 KPa  
 For the inside conditions of 25°C dry bulb, 50 percent RH:  
 Wi=9.2167×10<sup>-3</sup>kgw/kgda.  
 For the outside conditions of 40°C dry bulb, 22°C web bulb:  
 W<sub>0</sub>=0.011kgw/kgda, density of dry air = 1.1 kg/m<sup>3</sup>.  
 Latent heat of vapourisation = 2501×10<sup>3</sup>J/kgK  
 Specific heat at constant pressure Cp = 1021.6J / kgK

(OR)

- b. Explain the climate factors affecting building comfort? 10 2 1 1,2,4
27. a. Explain in details with help of neat sketch the working of solar passive cooling system for a building? 10 2 2 1,2,7

(OR)

- b. Explain the following with neat sketch: 10 2 2 1,2,7
- (i) Evaporative cooling  
 (ii) Water walls cooling
28. a. Explain the electric lighting control for the day lighted building and illumination requirement in detail. 10 2 3 1,6,7

(OR)

- b. Explain the different forms of lighting control strategies. 10 2 3 1,6,7
29. a. Explain about natural and forced ventilation method with neat sketch. 10 2 4 1,2,4

(OR)

- b. Determine the overall heat loss coefficient of 15.00cm thick RCC roof slab (k=0.8 W/mK) insulated with 5cm thick expanded polystyrene (k=0.05W/mK) and finished with 4.00cm thick brick tiles (k=1.5 W/mK) on the top, and 1.00cm thick cement plaster (k=0.7 W/mK) on the bottom. Assume convection heat transfer coefficient inside and outside the roof as 6W/m<sup>2</sup> K and 23W/m<sup>2</sup> K respectively. 10 4 4 1,2,6
30. a. Explain the needs of sustainable sites and landscaping, and also state the salient features of a green building? 10 2 5

(OR)

- b. Explain the green globe building assessment protocol and explain the features and rating of IGBC LEED 2009 in details. 10 2 5

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Reg. No.

**B.Tech. DEGREE EXAMINATION, MAY 2022**  
 Sixth Semester

18MEO103T – ENERGY SYSTEMS FOR BUILDINGS  
 (For the candidates admitted from the academic year 2018-2019 to 2019-2020)

**Note:**

- (i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40<sup>th</sup> minute.  
 (ii) **Part - B** should be answered in answer booklet.

Time: 2½ Hours

Max. Marks: 75

**PART – A (25 × 1 = 25 Marks)**

Answer ALL Questions

- |   | Marks | BL | CO | PO    |
|---|-------|----|----|-------|
| 1. Which one of the following is not used in the building insulation materials?<br>(A) Polystyrene (B) Mineral wool<br>(C) Polyurethane foam (D) Window glass                         | 1     | 1  | 1  | 1,2,4 |
| 2. The value of cooling load factor always lies between<br>(A) 0 to 1 (B) 1 to 10<br>(C) 10 to 100 (D) 100 to 1000  | 1     | 1  | 1  | 1,2,4 |
| 3. Which one of the following is an external load?<br>(A) Solar gain (B) Occupants<br>(C) Lighting (D) Equipments   | 1     | 1  | 1  | 1,2,4 |
| 4. Energy efficiency building is related to _____<br>(A) Technology improvements (B) Low-cost system<br>(C) Building strength (D) Global warming reduction with sustainability        | 1     | 2  | 1  | 1,2,4 |
| 5. Cooling load calculation is required for proving thermal comfort in<br>(A) Summer (B) Winter<br>(C) Year around (D) During the night   | 1     | 1  | 1  | 1,2,4 |
| 6. Trombe wall works based on<br>(A) Direct heat gain (B) Indirect gain<br>(C) Isolated gain (D) Electric heating   | 1     | 1  | 2  | 1,2,7 |
| 7. A system that collects, stores and redistributes solar energy without use of fans, pumps etc, is<br>(A) Passive solar (B) Active solar<br>(C) Thermal storage (D) Energy efficient | 1     | 1  | 2  | 1,2,7 |

8. \_\_\_\_\_ ventilation requires less energy, capital and maintenance costs, and contributes less green house gas (GHG) emissions. 1 2 2 1,2  
 (A) Mechanical (B) Natural  
 (C) Automatic (D) Hybrid ,7
9. The trombe wall system is also known as 1 1 2 1,2  
 (A) Thermal storage wall system (B) Heat storage wall system  
 (C) Energy storage wall system (D) Heat retention system ,7
10. Fin walls can greatly increase the \_\_\_\_\_ through windows on the same side of a building by changing the pressure distribution. 1 1 2 1,2  
 (A) Heat transfer (B) Mass transfer  
 (C) Ventilation (D) Humidification ,7
11. Which lamps can be directly connected to solar cell? 1 1 3 1,6  
 (A) Incandescent (B) Metal halide  
 (C) Compact florescent (D) LED ,7
12. What is the percentage loss of energy as heat in incandescent bulbs? 1 2 3 1,6  
 (A) 0.95 (B) 0.6  
 (C) 0.9 (D) 0.2 ,7
13. The unit supply of light is 1 1 3 1,6  
 (A) Lumen (B) Candela  
 (C) Lux (D) Cd/m<sup>2</sup> ,7
14. The daylight that enters a window among them which is not a source 1 1 3 1,6  
 (A) Direct sunlight (B) Clear sky  
 (C) Clouds (D) Reflection from the indoor wall ,7
15. Day light factor for kitchens are 1 1 3 1,6  
 (A) 4.5 (B) 3.5  
 (C) 2.5 (D) 1.5 ,7
16. Abbreviation of HVAC is 1 1 4 1,2  
 (A) Heating ventilation and air conditioning (B) Heating ventilation and air cooling  
 (C) Hot ventilation and air cooling (D) Heating ventilation and air control ,4
17. In \_\_\_\_\_ system the use is made of doors, windows, ventilators and skylights to make the room properly ventilated. 1 1 4 1,2  
 (A) Artificial ventilation (B) Natural ventilation  
 (C) Mechanical ventilation (D) Air conditioning ,4
18. Building with window facing \_\_\_\_\_ or \_\_\_\_\_ provide good access to illumination, ventilation and effortless shading. 1 2 4 1,2  
 (A) East; west (B) South; south  
 (C) South; west (D) North; south ,4

19. Preventing water leaks (or building keep dry) is one of the rule of 1 1 4 1,2  
 (A) Passive heating (B) Passive cooling  
 (C) Ventilation (D) Indoor air quality ,4
20. Which of the following is important in the exposure of the buildings? 1 1 4 1,2  
 (A) Reducing the cost (B) Reducing the area exposure to the radiation  
 (C) Reduce the land allocation (D) Reduce the time consumption of construction the buildings ,4
21. Which of the following is not an IAQ (Indoor air quality) rules? 1 1 5 1,2  
 (A) Avoid using toxic cleaning (B) Avoid storing toxic materials  
 (C) Avoid specifying building materials that will off gas (D) Does not require to eliminate the excess carbon dioxide water vapor, odors, etc from the room ,6
22. The environmental scientist said building is not efficient, if the building is not a \_\_\_\_\_ one. 1 1 5 1,2  
 (A) Building (B) Beautiful  
 (C) Sustainable (D) Efficiency ,6
23. LEED points of daylights if the building use 90% of daylight means 1 1 5 1,2  
 (A) 9 (B) 8  
 (C) 2 (D) 3 ,6
24. LEED deals with sustainable aspect of 1 1 5 1,2  
 (A) Agriculture (B) Building  
 (C) Chemical industry (D) Motor vehicles ,6
25. In sustainable planning, site appraisal's evaluate the \_\_\_\_\_ 1 1 5 1,2  
 (A) Site cleanliness (B) Indoor air quality (IAQ)  
 (C) Economic value of the land (D) Relationship between the building and its surrounding ,6

### PART – B (5 × 10 = 50 Marks)

Answer ALL Questions

Marks BL CO PO

26. a. An air conditioned room measures 5m wide, 5m high and 7m deep. One of the two 5m walls faces south and contains a double glazed glass window of size 2m by 1m, mounted flush with the wall with no external shading. Assume, there are no heat gain through the walls other than the one facing west. The factors affecting thermal load of the room are as following:  
 Inside conditions: 25°C dry bulb, 50 percent RH.  
 Outside conditions: 40°C dry bulb, 22°C wet bulb  
 U- value for wall: 3W/m<sup>2</sup>.K  
 U- value for roof: 1.5W/m<sup>2</sup>.K  
 U- value for floor: 1.1 W/m<sup>2</sup>.K 10 4 1 1,2  
 ,4