

M.E DEGREE EXAMINATIONS MAY/JUNE 2014

(Regulation 2013)

Second Semester

ENERGY ENGINEERING

P13EETE33: Energy Conservation in Building and HVAC

Time: Three Hours

Maximum Marks:100

Answer All Questions

PART A (10x 2=20 Marks)

1. Define embodied energy.
2. Define Wet bulb depression.
3. Justify the use of Steady state method in heating load calculations.
4. What do you mean by Zero Energy building?
5. Define luminous efficacy.
6. What is daylight factor?
7. Define thermal comfort in HVAC.
8. What is energy monitoring and targeting?
9. Where is performance evaluation of air conditioning unit term Energy Efficiency Ratio (EER) is used?
10. What are the effects of changing impeller diameter on pump performance?

PART B (5x16=80 Marks)

11. Explain the factors that influences thermal comfort.
12. (i) An air conditioned room that stands on a well ventilated basement measures 3 m wide, 3 m high and 6 m deep. One of the two 3 m walls faces west and contains a double glazed glass window of size 1.5 m by 1.5 m, mounted flush with the wall with no external shading. There are no heat gains through the walls other than the one facing west. Calculate the sensible, latent and total heat gains on the room, room sensible heat factor from the following information.

Inside conditions	: 25° C dry bulb, 50 percent RH
Outside conditions	: 43° C dry bulb, 24° C wet bulb
U-value for wall	: 1.78 W/m ² K

U-value for roof	: 1.316 W/m ² K
U-value for floor	: 1.2 W/m ² K
Effective Temp. Difference (ETD) for wall	: 25° C
Effective Temp. Difference (ETD) for roof	: 30° C
U-value for glass	: 3.12 W/m ² .K
Solar Heat Gain (SHG) of glass	: 300 W/m ²
Internal Shading Coefficient (SC) of glass	: 0.86
Occupancy	: 4 (90 W sensible heat/person) (40 W latent heat/person)
Lighting load	: 33 W/m ² of floor area
Appliance load	: 600 W (Sensible) + 300 W(latent)
Infiltration	: 0.5 Air Changes per Hour
Barometric pressure	: 101 kPa

(ii) What are the factors that affect building cooling load calculations. Explain in detail.

13. (i) Summarize the lighting system design considerations.
(ii) What are the devices or methods used to improve the day lighting in a building to minimise the artificial lighting load. Explain.
14. (i) Explain the techniques that improve indoor air quality in buildings.
(ii) What do you mean by building energy management? Explain the use of building energy management system in combating energy consumption in buildings.
15. Explain the energy saving opportunities in Fans and blowers.
16. A multi-storied shopping mall has installed 5 x 110 TR reciprocating compressors of which four compressors are in use for 16 hours per day. Due to higher energy cost shopping mall chief engineer has decided to replace reciprocating compressors with screw compressors. Chief engineer need following input from energy consultant. i. Comparison of power consumption of both reciprocating and screw compressors? ii. Annual cost savings (for 350 days operation). Present unit cost Rs 6.50 per kWh, investment for 220 TR machine Rs 30 lakh. iii. What should be the size of cooling tower required for proposed screw compressors?
