KATHMANDU UNIVERSITY
End Semester Examination
January/February 2024

Marks Scored:

Level : B.Arch.
Year : IV

26 JAN 2024

Course : MEEG 442
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date :

SECTION "A"

[20Q. × 0.5 = 10 marks]

Choose and mark [X] the most appropriate option from each set of choices

1. Which is a means of extinguishing fire?
   [ ] disconnect electrical supply from electrical service or item on fire
   [ ] switch light off and leave that floor
   [ ] spray water into burning electrical heater and evacuate
   [ ] throw fireproof blanket over burning computer

2. Sprinkle fire-fighting systems:
   [ ] must be manually turned on
   [ ] have self-acting outlets that fracture on rise of air temperature
   [ ] are the only fire-fighting systema building needs to have
   [ ] creates unnecessary damage

3. How does a fire commence?
   [ ] a small flame radiates combustibility over a long distance
   [ ] combustible material is raised to its ignition temperature in presence of oxygen
   [ ] electrical services often start fire
   [ ] any spark from a light switch or plant switch can start a fire

4. Which type of lift systems is often used in tall buildings and skyscrapers?
   [ ] hydraulic lift [ ] pneumatic lift [ ] traction lift [ ] scissor lift

5. What safety device is activated when elevator door sensors detect an obstruction?
   [ ] fire suppression system [ ] emergency stop button
   [ ] anti-vibration mechanism [ ] overload protection

6. What is the common term for the vertical section of a building that houses the lift and its components?
   [ ] elevator chamber [ ] shaft
   [ ] cabin compartment [ ] lift vestibule

7. What is the purpose of the counterweight in an elevator system?
   [ ] to balance the weight of lift cabin [ ] to generate power for the lift
   [ ] to regulate the elevator speed [ ] to control the motor operation

8. What is the primary goal of energy audit?
   [ ] maximizing energy consumption [ ] minimizing energy consumption
   [ ] ignoring energy efficiency [ ] focusing on energy generation

9. What is an energy baseline?
[ ] highest level of energy consumption
[ ] average level of energy consumption over a specific period
[ ] lowest level of energy consumption
[ ] it is not based on energy consumption alone

10. What is the first step in conducting energy audit?
[ ] implementing energy savings measures
[ ] analyzing energy bills
[ ] establishing the scope and objectives
[ ] detailed study of energy consumption pattern

11. What component is responsible for removing heat from the refrigerant in the air-conditioning cycle?
[ ] compressor [ ] condenser [ ] evaporator [ ] expansion valve

12. What role does the thermostat play in an air-conditioning system?
[ ] controlling the refrigerant flow [ ] monitoring outdoor temperature
[ ] regulating indoor temperature [ ] increasing system's cooling capacity

13. In summer comfort cooling, the air of the occupied space should not have a relative humidity above
[ ] 30% [ ] 40% [ ] 50% [ ] 60%

14. The optimum effective temperature for human comfort is
[ ] higher in winter than in summer [ ] lower in winter than in summer
[ ] same in winter and summer [ ] not dependent on season

15. What does the term "adaptive thermal comfort" refer to in context of building design and operation?
[ ] fixed temperature settings for all occupants
[ ] adjusting clothing insulation based on the season
[ ] maintaining a constant indoor temperature throughout the year
[ ] ignoring occupant preferences

16. The relative humidity during sensible cooling process
[ ] increases [ ] decreases [ ] remains same [ ] unpredictable

17. The curved lines on a psychrometric chart indicates
[ ] dry bulb temperature [ ] wet bulb temperature
[ ] specific humidity [ ] relative humidity

18. When the air is passed through a solid chemical absorbent, psychrometric process followed is:
[ ] heating and dehumidification
[ ] cooling and dehumidification
[ ] dehumidification with sharp rise in wet bulb temperature
[ ] dehumidification at constant dry bulb temperature

19. The atmospheric air at DBT 15°C enters heating coil whose temperature is 41°C. If the bypass factor of heating coil is 0.5, what will be the DBT of air leaving the coil?

[ ] 26°C [ ] 30°C [ ] 28°C [ ] 29°C

20. The degree of warmth or cold felt by a human body depends on

[ ] dry bulb temperature [ ] relative humidity

[ ] air velocity [ ] all of these

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F. M. : 40

SECTION "B"

Attempt *ALL* questions. Assume suitable data if necessary.
Psychrometric chart is attached. Use it where applicable.

1.

a. What is psychrometry? Define dry and wet bulb temperature and explain how wet bulb temperature is measured. [1+2]

b. A machine working on a Carnot cycle operates between 305 K and 260 K. Determine the coefficient of performance, COP when the machine is working as i) refrigerator and ii) heat pump [2]

c. The atmospheric air at 15°C dry bulb temperature and 80% relative humidity is supplied to the heating chamber at the rate of 100 m^3/min. The leaving air has temperature of 22°C without change in its moisture content. Determine heat added to the air per minute and final relative humidity of air. [3]

2.

a. An air-conditioned plant is to be designed for a small office room for winter when outdoor conditions are 10°C DBT and 8°C WBT and the indoor comfort conditions are 20°C DBT and 60% rh. The amount of air circulated is 0.3 m^3/min/person and seating capacity is 50.
The required condition is achieved first by heating and then by adiabatic humidifying. Find the heating capacity of coil in kW and its surface temperature if by-pass factor of coil is 0.32. Also find the capacity of humidifier. [4]

b. A cinema hall of 2000 seating capacity is air-conditioned when outdoor conditions are 40°C DBT and 45% rh and indoor air-conditioned conditions are 24°C and 60% rh. The quantity of conditioned air supplied is 0.25 m^3/min/person. 60% of the conditioned air is recirculated and mixed with 40% of fresh air. The required condition is achieved first by cooling and dehumidifying and then heating. If the apparatus dew point temperature of cooling coil is 13°C, find the capacity of the cooling coil in tons of refrigeration and its by-pass factor. Also find capacity of heating coil in kW and its surface temperature if by pass-factor of heating coil is 0.3. [7]

c. Describe air handling units, AHUs and their applications in buildings. [3]

d. List out major cooling/heating loads in buildings and describe any one of them in details. [1+2]

3.

a. Explain gaseous systems and water mist systems for fire suppression. [2]

b. Explain dry and wet hydrant riser type of fixed fire-fighting installation. [3]

4.

a. Explain working of a hydraulic lift. Write difference between elevator, escalator and paternoster based on their uses. [2]

b. Explain the environmental parameters that define thermal human comfort. Based on these paraments explain the concept of heat index and wind chill index. Also mention why it is necessary to measure these. [3]

5.

a. Discuss the importance of energy efficient buildings in mitigating climate change. Support your answers with some examples. [2]

b. Define energy audit. What is the difference between preliminary energy audit and targeted energy audit. Explain with suitable examples. [3]