Reg No.:_____ Name:_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

B.Tech Degree S8 (R,S) Examinations April 2026 (2019 Scheme)

# Course Code: MET474
# Course Name: HEATING AND VENTILATION SYSTEMS

**Max. Marks: 100** **Duration: 3 Hours**

## PART A

***Answer all questions, each carries 3 marks.*** Marks

| | | | |
|---|---|---|---|
| 1 | | What is HEPA filter? Where is it used? | (3) |
| 2 | | Explain why return air is mixed with outdoor air in HVAC systems. | (3) |
| 3 | | What makes inverter air conditioners more energy-efficient than traditional ones? | (3) |
| 4 | | Explain the application of Cassette AC System. | (3) |
| 5 | | Write down the chemical formula of refrigerant a) R12, b) R113 and c) R717. | (3) |
| 6 | | Explain the terms ODP and GWP, describe how they influence the choice of refrigerants. | (3) |
| 7 | | Explain the concept of IEER and how it differs from COP in evaluating the efficiency of an HVAC system. | (3) |
| 8 | | What is SHF, RSHF and GSHF? | (3) |
| 9 | | Interpret the purpose of symbols and legends in HVAC drawings. | (3) |
| 10 | | List any three methods used for duct design. | (3) |

## PART B

***Answer any one full question from each module, each carries 14 marks.***

### Module I

| | | | |
|---|---|---|---|
| 11 | a) | Explain the concept of a comfort chart and describe how the comfort region is identified for all-round air conditioning. | (7) |
| | b) | Explain the working of ultrasonic humidifier with neat sketch. | (7) |

**OR**

| | | | |
|---|---|---|---|
| 12 | a) | Explain the concept of effective temperature and describe the factors that influence it. | (7) |
| | b) | Explain any two methods of dehumidification and represent it as line diagram in psychrometric chart. | (7) |

### Module II

| | | | |
|---|---|---|---|
| 13 | a) | What is a Constant Air Volume (CAV) system in centralized air conditioning? Explain the working principles of the Dual Duct System and the Multi-Zone system with neat schematic diagrams. | (8) |
| | b) | Explain the working of Fan Coil Unit with neat sketch. | (6) |

**OR**

| | | | |
|---|---|---|---|
| 14 | a) | Describe the working principle of VRF system and explain its key features. | (8) |
| | b) | Explain the All-Water system used in HVAC. How does it differ from an Air-Water system? | (6) |

**Module III**

| | | | |
|---|---|---|---|
| 15 | a) | A hospital HVAC system requires efficient air distribution with minimal noise. Choose a suitable type of outlet and explain its placement and function to optimize airflow. | (8) |
| | b) | Explain the function of an Air Handling Unit (AHU) in an HVAC system. Describe its main components and how it contributes to maintaining indoor air quality and comfort. | (6) |

**OR**

| | | | |
|---|---|---|---|
| 16 | a) | What are the different types of compressors commonly used in HVAC systems? Describe the working of any one type using a schematic diagram. | (8) |
| | b) | Explain the importance of refrigerant leak detection in HVAC systems. Describe common methods used to detect refrigerant leaks. | (6) |

**Module IV**

| | | | |
|---|---|---|---|
| 17 | a) | Describe the different methods used to verify the cooling capacity of a newly installed air conditioning system during its commissioning. Why is it important to carry out these checks? | (8) |
| | b) | Explain the factors to be considered while designing (i) Basement Ventilation and (ii) Pantry Ventilation. | (6) |

**OR**

| | | | |
|---|---|---|---|
| 18 | a) | What are passive design strategies used to reduce cooling or heating loads in buildings? Explain any three methods and how can they contribute to energy-efficient HVAC operation. | (8) |
| | b) | Why is cooling load calculation important? Describe the basic steps followed in calculating the cooling load in an air conditioning system. | (6) |

**Module V**

19 a) A duct carries 1.5 $m^3/s$ of air at a velocity of 6 m/s. (a) Find the equivalent diameter of a circular duct that has the same area as a rectangular duct of 0.4 m × 0.2 m. (b) Compare the pressure drop characteristics of the rectangular and circular ducts. (7)

b) Describe the layout and airflow pattern of radial and perimeter loop duct systems. How do these two systems differ in terms of their application and performance? (7)

**OR**

20 a) Explain the general considerations to be followed while designing an air duct layout. Also, describe the basic principles that govern effective air distribution in HVAC systems. (7)

b) Why is it important to manage noise and vibration in HVAC systems? Explain the different methods used to control sound and vibration. (7)

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