



K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:V
Class:TY	Program:B.Tech
Branch Code:MEC	Pattern:2023
Name of Course:Overview of HVAC&R Systems and Equipment Selection	Course Code:2305381
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains __03 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

Marks CO

Question No. 1

- 1a) Refrigerant circuit is to cool room at 0°C using outside air 30°C to reject heat refrigerant is R134a, (6) 01
temperature difference of evaporator and condenser is 5K.
find out Carnot COP
A. For process
B. For Refrigerant cycle
C. For an ideal vapor compression cycle using R134a.

Question No. 2

- 2a) Centrifugal Pumps manufactured in India are exported to Argentina. Pump is rated for 50Hz in (6) 01, 02
India and flow rate of 380 GPM and 40 ft head using 6 BHP. If rated frequency in Argentina is 60
Hz What will be pump GPM, head, and BHP.Assume 4 poles motors in India.

Question No. 3

- 3a) Define IPLV and NPLV. (8) 01, 02
Calculate IPLV of chiller plant having following Kw/TR load
a. 100% load weight 1%.
b. 75% load weight 42%.
c. 50% load weight 45%.
d. 25% load weight 12%.
Assume that A is 0.6 Kw/TR

Assume that B is 0.53 Kw/TR

Assume that C is 0.47 Kw/TR

Assume that D is 0.44 Kw/TR

OR

3b) A 100 TR plant chiller water plant is to be designed .Inlet temperature of evaporator 12°C and outlet temperature of evaporator is 7°C.Inlet temperature of condenser 32°C and Outlet temperature of condenser 36°C.Find out condenser and evaporator flow rate in USgpm

(8) 01, 02

- 3c) In an AC System a cooling coil handles 24,000 CFM of air entering at 86 F DBT and 73°F WBT. The air leaves the coil at 59°F DBT and 56°F WBT. Determine the coil capacity (8) 03

OR

- 3d) In a cooling coil of AC find the required effective surface temperature (ADP), contact factor, Bypass factor for cooling coil if the air is to be cooled from 85°F DBT and 69°F WBT to 56°F DBT and 54°F WBT (8) 03

Question No. 4

- 4a) An office building is being studied for load calculation.20000 sq. Ft is the office area having occupant density of 20 people per 1000 sq. Ft. If outdoor rate is 7.5 CFM per person and 0.12 CFM per sq. Ft is required. (8) 03, 04

A) Calculate the total ventilation CFM required.

B) If office area height is 10 Ft, then calculate the air change per hour.

OR

- 4b) Duct design for a facility is being carried out. Air is flowing in a duct of 48 sq.in cross-section area at velocity of 2400 ft/min. if velocity reduced to 1300 ft/min. what size of ducts should be considered. (8) 03, 04

- 4c) Total pressure and static pressure are measured at 66.6 Ft for of water column and 64.8 Ft water column respectively in a condenser water flow from refrigeration machine what is velocity line. (8) 03, 04

OR

- 4d) An HVAC contractor wishes to check the air flow rate in a duct 28 inches by 16 inches. The contractor recorded six velocity readings: 0.8, 0.9, 0.75, 0.95, 1.2, and 1.1. What is the air flow rate in the duct? (8) 03, 04

Question No. 5

- 5a) Explain (8) 03, 04

1. Ozone depletion

2. Energy conservation in Buildings

3.Sustainability and Climate change

4. PM10 and PM2.5

OR

- 5b) Explain design principles by which a building can be made more energy efficient. (8) 03, 04

- 5c) During energy audit an operating engineer wants to determine efficiency of condenser water pump; the pump flow rate is 260GPM with total head of 40 Ft. The electric meter show pump motor is drawing 4.2 KW. (8) 03, 04

Estimate the pump motor efficiency

OR

5d) A heating system uses 20,000 CFM of ventilation exhaust air. The exhaust air temperature is 72 °F intake air temperature is 35 °F, system operate for 1000 hours, heat recovery wheel system is installed in it, heat wheel heat intake air to 61°F. fuel oil which use for heating having heating value of 1,40,000 BTU/ gallon, If the cost of oil is rupees 2000 per gallon.
how much energy oil and money save?

(8) 03, 04

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