



# BHARTIYA SKILL DEVELOPMENT UNIVERSITY

## School of RAC Skills

III Semester, 2<sup>nd</sup> In-Sem. Examination

B. Voc. Program, Summer Semester (2020-21)

Course Code: HVA1301

Time: 1 Hour

Course Name: Refrigerant & Psychrometry

Max. Marks: 20

SET-A

### Instruction:

1. Attempt all Questions.
2. Psychrometric chart is allowed.
3. Each question of Section – A carries 01 mark.
4. Each question of Section – B carries 02 mark.
5. Each question of Section – C carries 03 mark.

### Section – A

05X01 = 05 Marks

1. The instrument sling psychrometer is used for measuring-
  - a. DBT
  - b. DPT
  - c. both a & b
  - d. None of the above
2. Specific enthalpy is measured in-
  - a. KJ/Kg
  - b. KJ
  - c. KJ/Kg-K
  - d. None
3. The comfort air conditioning system represents-
  - a. Indoor air quality
  - b. Air motion
  - c. Both a and b
  - d. None of the ab above
4. The rate of body heat loss is affected by-
  - a. Air Humidity
  - b. Air motion
  - c. Both a and b
  - d. None of the ab above

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5. The actual condition of atmospheric air is-

- a. Dry air
- b. moist air
- c. both a & b
- d. None of the ab above

### Section – B

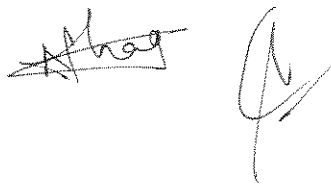
03X02 = 06 Marks

1. Write down the definition of psychrometry.
2. Discuss the sensible cooling process.
3. Draw the cooling and heating with dehumidification process on the Psychrometric chart.

### Section – C

03X03 = 09 Marks

1. Explain different types of air conditioning processes with the help of Psychrometric chart.
2. Discuss the heating and humidification process in detail.
3. Calculate the following properties of air at DBT 35° C and WBT 25° C:
  - a) DPT
  - b) RH
  - c) Enthalpy





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## School of RAC Skills

III Semester, 2<sup>nd</sup> In-Sem. Examination

B. Voc. Program, Summer Semester (2020-21)

### ANSWER KEY-A

Course Code: HVA1301

Course Name: Refrigerant & Psychrometry

Time: 1 Hour

Max. Marks: 20

#### Section – A

05X01 = 05 Marks

1. The instrument sling psychrometer is used for measuring-
  - a. DBT
2. specific enthalpy is measured in-
  - a. KJ/Kg
3. The comfort air conditioning system represents-
  - c. Both a and b
4. The rate of body heat loss is affected by-
  - c. Both a and b
5. The actual condition of atmospheric air is-
  - b. moist air

#### Section – B

03X02 = 06 Marks

1. Write down the definition of psychrometry.

**ANSWER:** The branch which deals with the properties of moist air.

2. Discuss the sensible cooling process.

**ANSWER:** During this process, the moisture content of air remains constant but its temperature decreases as it flows over a cooling coil.

The dry bulb temperature decreases.

The relative humidity increases.

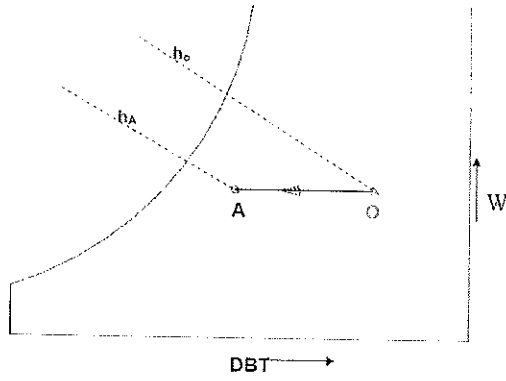
The enthalpy decreases.

The wet bulb temperature decreases.

The specific volume decreases.

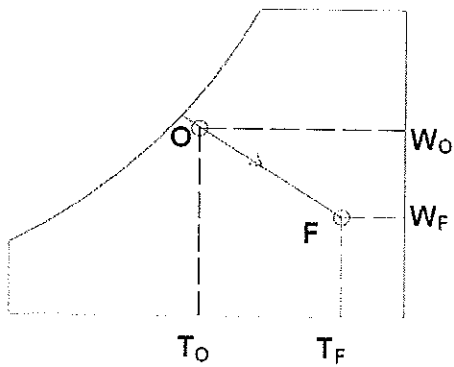
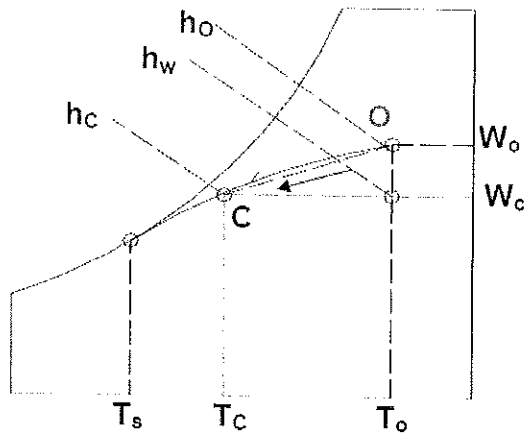
The humidity ratio, vapor pressure and dew point remains constant.

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3. Draw the cooling and heating with dehumidification process on the Psychrometric chart.

Answer:

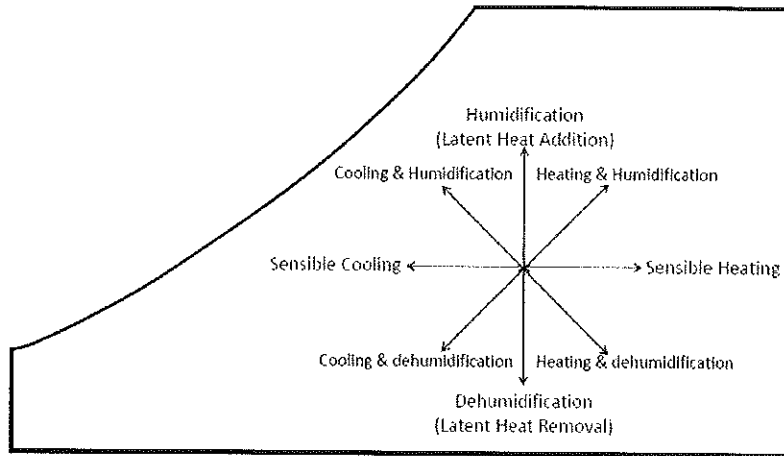


Section – C

03X03 = 09 Marks

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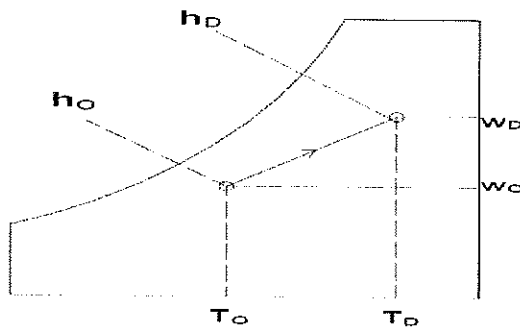
1. Explain different types of air conditioning processes with the help of Psychrometric chart.



2. Discuss the heating and humidification process in detail.

**Answer:**

During winter it is essential to heat and humidify the room air for comfort. This is normally done by first sensibly heating the air and then adding water vapour to the air stream through steam nozzles. This is the process of introducing moisture into the airstream. This is achieved in various ways that range from using spray washers to passing the air over a pool of water to injecting steam.



3. Calculate the following properties of air at DBT 35 °C and WBT 25 °C:

Answer:

- a) DPT = 16 Deg. Celcius
- b) RH = 45%
- c) Enthalpy = 76 KJ/Kg





School of RAC Skills  
Session: 2020-21 (Summer Semester)  
B. Voc. Program 3<sup>rd</sup> Semester,  
2<sup>nd</sup> In-Sem Examination

Course Code: HVA1302

Course Name: Compressor Condenser Evaporator

Time: 1 Hours

Max. Marks: 20

Instruction:

- (a) Attempt all questions
- (b) Use Calculator if required

Set A

Section – A

05X01 = 05 Marks

1. Which of the following is not related to the p-h chart?
  - a) Triple point
  - b) Critical point
  - c) Temperature Lines
  - d) Specific Volume lines
2. Which process is related to the expansion valve?
  - a) Isothermal heat rejection
  - b) Isobaric refrigerant expansion
  - c) Isenthalpic cooling
  - d) Isenthalpic expansion
3. Which compressor has suction and discharge valves?
  - a) Rotary Compressor
  - b) Screw Compressor
  - c) Single acting Compressor
  - d) Centrifugal Compressor
4. Which component of the VCR system works according to the (P-H Chart) following equation?  $Q = m \times (h_2 - h_3)$ 
  - a) Compressor
  - b) Condenser
  - c) Evaporator
  - d) Expansion Valve
5. One Air conditioner system extracts heat from 20°C and rejects it in ambient (40 °C), what will be the Carnot COP of the system?
  - a) 12.65
  - b) 13.65



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c) 14.65

d) 15.65

## Section – B

02X03 = 06 Marks

1. After plotting a P-H chart of a VCR system working on R12, values of  $h_1$ ,  $h_2$ ,  $h_4$  are respectively 345, 375, 235. Find the value of the theoretical COP of the system and also write the unit of enthalpy.
2. Write a short note on the scroll refrigerant compressor.
3. Explain the working of an evaporator with a suitable sketch.

## Section – C

03X03 = 09 Marks

1. How can we classify cooling towers, explain each type briefly?
2. Write a short note on the P-H chart.
3. Explain working of all major components (parts) of cooling tower.



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Registration No.: .....

School of RAC Skills  
Session: 2020-21 (Summer Semester)  
B. Voc. Program 3<sup>rd</sup> Semester,  
2<sup>nd</sup> In-Sem Examination

Course Code: HVA1302

Course Name: Compressor Condenser Evaporator

Instruction:

- (a) Attempt all questions
- (b) Use Calculator if required

Time: 1 Hours

Max. Marks: 20

## Set A- Answer sheet

### Section – A

05X01 = 05 Marks

1. Which of the following is related to the p-h chart?  
**b) Triple point**
2. Which process is related to the expansion valve?  
**d) Isenthalpic expansion**
3. Which compressor has suction and discharge valves?  
**c) Single acting compressor**
4. Which component of the VCR system works according to the (P-H chart) following equation?  
$$Q = m \times (h_2 - h_3)$$
**b) Condenser**
5. One Air conditioner system extracts heat from 20 °C and rejects it in ambient (40 °C), what will be the Carnot COP of the system?  
**c) 14.65**

### Section – B

02X03 = 06 Marks

1. After plotting a P-H chart of a VCR system working on R12, values of h<sub>1</sub>, h<sub>2</sub>, h<sub>3</sub>, h<sub>4</sub> are respectively 345, 375, 235. Find the value of the theoretical COP of the system and also write the unit of enthalpy.

Answer:

$$\text{Theoretical COP} = \frac{h_1 - h_4}{h_2 - h_1}$$

$$\text{Theoretical COP} = \frac{345 - 235}{375 - 345} = 110/30 = 3.66$$

Unit of Enthalpy = KJ/ Kg

2. Write a short note on the scroll refrigerant compressor.

Answer :-

“Scroll compressors are orbital motion, positive-displacement machines that compress with two interfitting, spiral-shaped scroll members.”

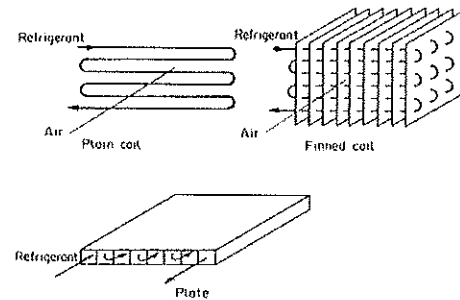
Scroll compressors are becoming more popular for use in HVAC systems, as they are more reliable, more efficient and have less moving components than reciprocating types. A scroll compressor has one fixed scroll which remains stationary and another moving or orbiting scroll that rotates through the use of a swing link. When this happens, the pockets of refrigerant between the two scrolls are slowly pushed to the center of the two scrolls, causing the reduction of the volume of the gas. It is then discharged through the center port to the condenser.

3. Explain the working of an evaporator with a suitable sketch.

Answer :-

Evaporator carries low temperature low pressure liquid refrigerant inside a cooling coil surrounded by fins which aid effective exchange of heat. Refrigerant entering the evaporator is at a lower temperature than the Surrounding (room air).

After heat exchange with the surrounding refrigerant turns into vapor. If we talk about the Air Conditioner then, air on the other hand, becomes chilled enough so that it can enter the room, take away the heat inside the room and attain the set temperature.



### Section – C

03X03 = 09 Marks

1. How can we classify cooling towers, explain each type briefly?

Answer :-

1. According to Construction

- a. Packaged type: - These types of cooling towers are relatively small and do not need big space. These type of cooling tower are normally forced cooled to increase the heat transfer rate



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- b. **Field Erection type:** - This type of cooling tower is big and size, and needs large space to construct. This type of CT is used to provide big cooling capacity, water consumption is also high. This type of cooling can be natural or forced draft, according to application

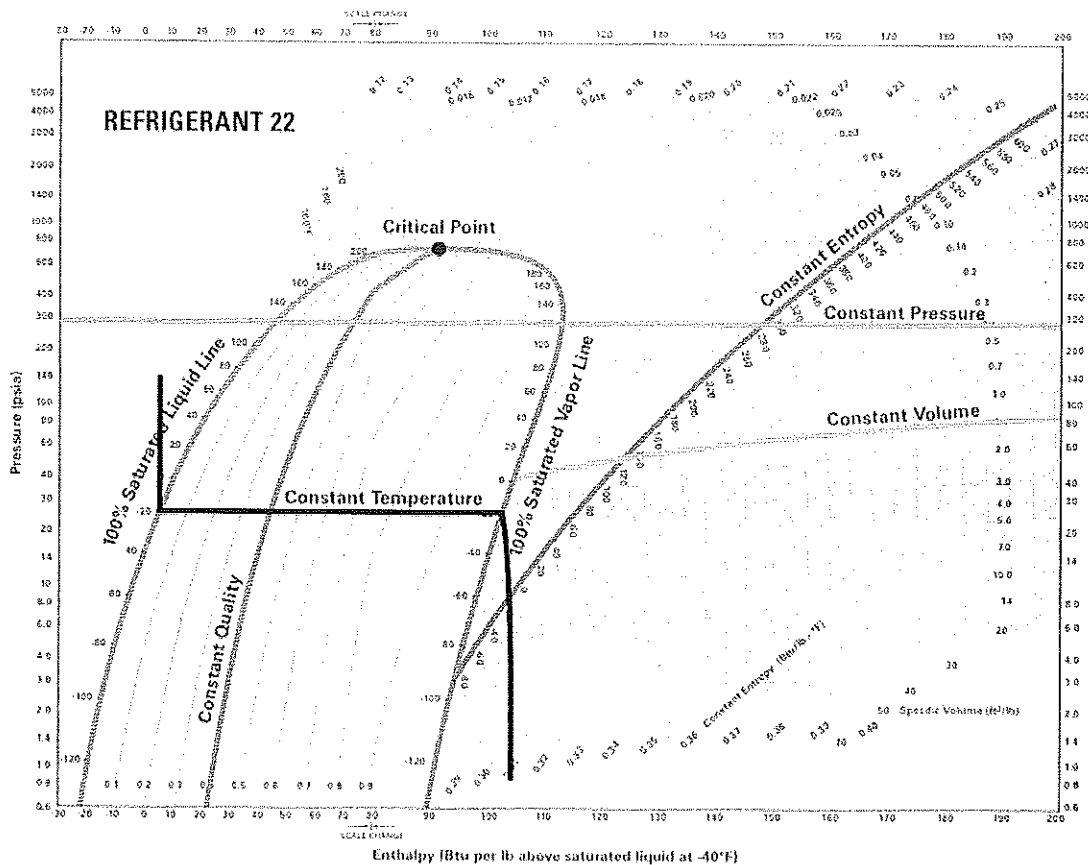
## 2. According to Heat Transfer

- a. **Closed Cooling towers:** - Primary water does not come in contact with air. Secondary water circuit may (evaporative or adiabatic) or may not (dry) be present.
- b. **Open Cooling towers:** - All the water flowing through the cooling tower, comes in contact with the air and undergoes evaporative cooling. In applications where the equipment in the downstream of cooling tower is susceptible to fouling/scaling issues, a plate type heat-exchanger is introduced in between to limit the scaling/fouling of the heat exchanger plates and limit the scaling/fouling of downstream equipment like chillers.

## 3. According to air flow

- a. **Natural Flow:-** These cooling towers do not use a fan. Natural air flow is produced by density differential between heated and cold air.
  - i. Usually used in power sector
  - ii. Flow Rates > 15500 LPS
- b. **Forced draft:** - In these cooling towers, the fan(s) is provided which forces the air stream into the cooling tower.
  - i. Low sound emissions as compared to induced draft
  - ii. Suitable for indoor/high static head applications
  - iii. Care required during operation, as small leaks can have troublesome effects due to forced draft's pressurized upper casing
- c. **Cross Flow :-** Air flows horizontally through the fill across downward fall of water
  - i. Lower operating cost as air flow is not directly opposing water flow (lower fan power)
  - ii. These cooling towers can be placed butted together next to each other as air intake is only from 2 out of 4 sides
  - iii. Capacities usually begin from 2MW, so not suitable for smaller applications

- d. **Counter Flow:** - Air moves vertically upward through the fill, counter to downward fall of water.
- i. Lower operating weight than cross-flow.
  - ii. Coldest air is in intimate contact with the entire cross-section of water just before it falls into the basin.



2. Write a short note on the P-H chart.

**Answer: -**

On the P-H diagram, pressure is indicated on the y-axis and enthalpy is indicated on the x-axis. Typically enthalpy is in units of Btu/lb and pressure is in units of pounds per square inch (psi). The upside down U figure shown on the diagram designates the points at which the refrigerant changes phase. The left vertical curve indicates the saturated liquid curve and the right vertical curve indicates the saturated vapor curve. The region in between the two curves describe refrigerant states that contain a mixture of both liquid and vapor. The locations to the left of the saturated liquid curve indicate that the refrigerant is in liquid form and locations to the right of the saturated vapor curve indicate that the refrigerant is in vapor form. The point at which the two curves meet is called the critical point. The



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importance of this point is that at any point above, no additional pressure will change the vapor into a liquid. A simplified pressure-enthalpy diagram is shown below, describing this information.

1) Liquid Region: The liquid region is also known as the subcooled region. In this region there are vertical temperature lines, which increase as enthalpy is increased. Figure 8 is a simplified P-H diagram illustrating the constant temperature lines.

(2) Vapor Region: The vapor region is also known as the superheated region. In this region there are vertical temperature lines, which increase as enthalpy is increased. Refer to Figure 8. There are also lines of constant entropy, which are also important. Entropy is the measure of the amount of disorder in the system.

(3) Liquid-Vapor Mix Region: In this region, the P-H diagram shows horizontal temperature lines, which indicate constant temperature. In this region liquid and vapour both present according to the temperature and pressure.

3. Explain working of all major components (parts) of cooling tower.

Answer: -

1. Frame and casing: support exterior enclosures
2. Fill: Cooling Tower Fill is the main heat transfer area available for Heat transfer from Hot water to Cold Air. There are two types of fills available namely Splash fills & Film Fills. Splash fills disintegrate the hot water from vertical direction and it splits the water to pass through the next level of splash bars. Film fills form a thin vertical film of water to make the air to contact in with to aid heat transfer. Fills are normally made of PVC, Polypropylene or Wood.
  - a. Splash fill
  - b. Film fill
3. Cold water basin: receives water at bottom of tower.
4. Drift eliminator: - is to reduce the drift loss in the cooling tower. Drift eliminators normally kept next to fills in the air flow path thereby reducing the drift loss. Drift loss is the loss of entrained water through hot air to the atmosphere. Drift eliminators normally made up of PVC. More number of passes through drift eliminator decreases the drift loss but increases the pressure drop thereby increasing fan power consumption.
5. Air inlet: entry point of air
6. Louvers: equalize air flow into the fill and retain water within tower



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7. Nozzles: Plastics are widely used for nozzles. Many nozzles are made of PVC, ABS, polypropylene, and glass filled nylon. Nozzles are used to provide uniform distribution of hot water inside a cell of a cooling tower. Recent advancement of the design involves a non clogging type nozzle.
8. Fans: Explosion proof motors are preferred for use in Petrochemical & Refinery cooling tower applications. As the Hot Cooling water from exchangers may have explosive gas if a heat exchanger is leaky. Motor is to be provided with Protection systems like Earth fault relay and overload relay etc.



## School of HVAC&R Skills

Session: 2020-21 (Summer Semester)

B. Voc. 3<sup>rd</sup> Semester,

2<sup>nd</sup> In-Sem. Examination

Course Code: HVA-1303

Course Name: Air Distribution

Instruction: Attempt all questions.

Time: 1 Hour

Max. Marks: 20

Set -A

Section – A

05X01 = 05 Marks

1. First bend in any of the branch after a reftnet must be at?  
a) 600mm b) 700mm c) 1000mm d) 500 mm
2. Which of the following filters uses oil to retain dust :  
a) Pleated Filters  
b) Roll Filter  
c) Viscous Impingement filter  
d) Electrostatic filter
3. Efficiency of a HEPA filter is –  
a) 90%  
b) 99.9%  
c) 89%  
d) 95%
4. Which of the following has its bearing size reduced due to its design:  
a) Forward Curved Centrifugal Fan  
b) Backward Curved Centrifugal Fan  
c) Axial Fan  
d) All of the above
5. What is VFD  
a) Very Frequent Drive  
b) Variable Flow Drive  
c) Variable Frequency Drive  
d) None of the above

Section – B

03X02 = 06 Marks

1. What is a VRV/VRF?
2. Why is air Refrigeration HP?
3. What are axial fans?

Section – C

03X03 = 09 Marks

1. What are ducts and how are they represented in drawings?
2. What are the control devices used in Air distribution System?
3. Write about any three-distribution selection criterion?





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2<sup>nd</sup> In-Sem. Examination

Course Code: HVA-1303

Course Name: Air Distribution

Instruction: Attempt all questions.

Time: 1 Hour

Max. Marks: 20

Set -A

Section – A

05X01 = 05 Marks

1. D
2. C
3. B
4. A
5. C

Section – B

03X02 = 06 Marks

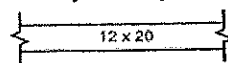
1. Total volume of refrigerant in the system is constant. It is only the volume of the refrigerant which is circulating or flowing in the system that gets changed according to load requirements from the indoor unit.
2. In VRV, the outdoor units and the indoor units are connected to each other by piping and wiring. The cooling capacity of VRV is defined in terms of Refrigeration HP which can be related to Ton of Refrigeration (TR) by using the conversion:  
**1 Refrigeration HP = 0.825 TR**
3. The propeller fan is used as an exhaust fan and condenser fan. It will handle large volumes of air at low pressure differentials

Section – C

03X03 = 09 Marks

1. A duct is a tube or conduit for conveying air. Ducts are classified in terms of application and pressure. HVAC systems in public assembly, business, educational, general factory and mercantile buildings are usually designed as commercial systems. Air pollution control systems, industrial exhaust systems and systems outside the pressure range of commercial system standards are classified as industrial systems. Ducts may be round, oval or rectangular. They may be made of galvanized steel, aluminum, fibrous glass and other materials. They may be rigid or flexible.

Duct size, first figure is side shown



Duct section, positive pressure, (supply air) first figure is top



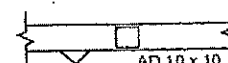
Duct section, negative pressure (exhaust or return air)



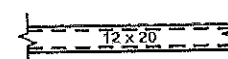
Change of elevation rise (UP) drop (DN)



Access doors, vertical or horizontal



Lining, figures are net inside dimensions (open area)





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2. A control is a device that regulates a variable such as temperature, velocity or pressure. Controls may be manual or automatic. For example, an air handling unit might have a manually set minimum flow of outside air and an automatic control to increase the outside air as the building becomes more densely occupied. If automatic, the implication is that the control is responsive to a measured change in pressure, temperature or some other variable to be regulated. Two common and important controls are dampers and thermostats.

3. **Building characteristics:**-Determine building materials, areas, external surface colors and shapes from building plans and specifications.

**Building configuration:** Determine building location, orientation and external shading from building plans and specifications. Shading from adjacent buildings should be carefully evaluated as to its probable permanence before including it in the calculation. The possibility of abnormally high ground-reflected solar radiation (for example, from adjacent water, sand or parking lots), or solar load from adjacent reflective buildings should be considered.

**Thermal zones:**- The thermal zones within the building should be identified. For example, external offices with windows will have different thermal characteristics than windowless rooms in the building's interior. Additionally, some areas of the building may have to be kept at different temperatures than others.



**School of RAC Skills**  
**Session: 2020-21 (Summer Semester)**  
**B. Voc. Program 3<sup>rd</sup> Semester,**  
**2<sup>nd</sup> In-Sem Examination**

**Course Code: HVA1304**

**Time: 1 Hours**

**Course Name: Thermal Insulation**

**Max. Marks: 20**

**Instruction:**

- (a) Attempt all questions**
- (b) Use Calculator if required**

**Section – A**

**05X01 = 05 Marks**

1. What is the unit of coefficient of thermal convection "h"?
  - a)  $W/ m^2$
  - b)  $M^2/ W$
  - c)  $W/ M^2. K$
  - d)  $M^2. k/ W$
2. Which insulation material is used in refrigerators?
  - a) Glass Wool
  - b) XPS
  - c) EPS
  - d) polystyrene
3. Which thermal insulating should not be used by bare hands?
  - a) Glass Wool
  - b) Rock Wool
  - c) polystyrene
  - d) Foam Glass
4. Consider heat transfer through glass window; area of wall and h-value are  $1m^2$ , 0.9, respectively. find the total thermal resistance?
  - a) 1.11 K/W
  - b) 1.11 K/  $M^2. W$
  - c) 2.11 W/ K
  - d) 2.11 K/  $M^2. W$
5. An iron plate has a  $5cm^2$  area and 10cm length and k-value of 5 W/ M.K. What will be the thermal resistance of the plate?
  - a) 5 W/ K
  - b) 4 K/  $M^2. W$
  - c) 4 K/ W
  - d) 5 K/  $M^2. W$

### Section – B

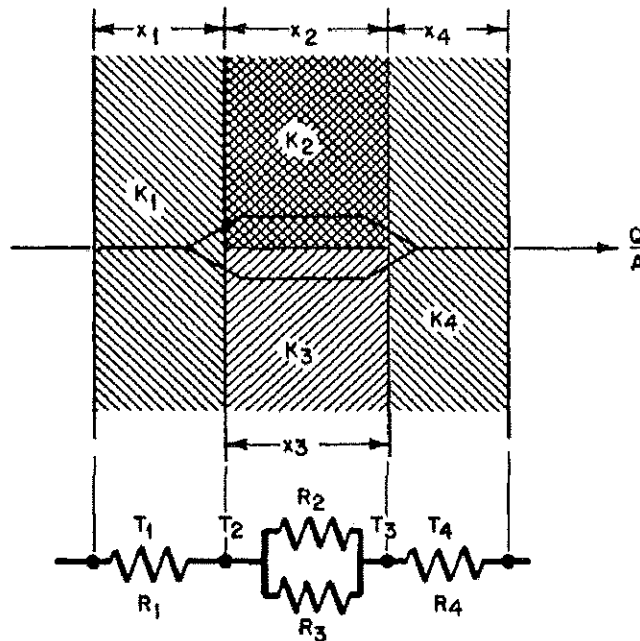
03X02 = 06 Marks

1. Explain following: -
  - a) R-value
  - b) U-value
2. What are various advantages of using thermal insulation materials in buildings?
3. Write a short note on conduction.

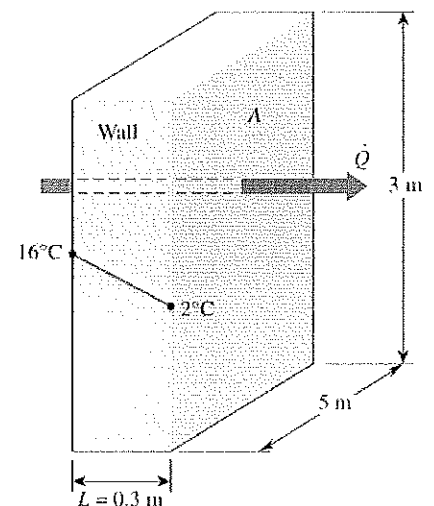
### Section – C

03X03 = 09 Marks

1. Drive the expression for heat transfer through a plane composite wall as shown in figure.



2. Write a short note on following
  1. EPS
  2. XPS
3. Consider a 3m high, 5m wide, and 0.3m thick wall whose thermal conductivity is  $k = 0.9 \text{ W/m}\cdot\text{K}$ . On a certain day, the temperatures of the inner and the outer surfaces of the wall are measured to be  $16^\circ\text{C}$  and  $2^\circ\text{C}$ , respectively. Determine the rate of heat loss through the wall on that day.



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School of RAC Skills  
Session: 2020-21 (Summer Semester)  
B. Voc. Program 3<sup>rd</sup> Semester,  
2<sup>nd</sup> In-Sem Examination

Course Code: HVA1304

Time: 1 Hours

Course Name: Thermal Insulation

Max. Marks: 20

Instruction: (a) Attempt all questions (b) Use Calculator if required

Section – A

05X01 = 05 Marks

1. What is the unit of coefficient of thermal convection "h"?  
c) W/ M<sup>2</sup>. K
2. Which insulation material is used in refrigerator?  
d) Polystyrene Insulation
3. Which thermal insulating should not be used by bare hands  
a) Glass Wool
4. Consider heat transfer through a glass window. Area of wall and h-value are 1m<sup>2</sup>, 0.9, respectively. find the total thermal resistance?  
a) 1.11 K/ W
5. An iron plate has a 5cm<sup>2</sup> area and 10cm length and k-value of 5 W/ M. K what will be thermal resistance of the plate?  
c) 4 K/ W

Section – B

03X02 = 06 Marks

- 1) Explain following: -
  - a) R-value
  - b) U-value

Answer: -

R-Value and U-value: -

R value shows how well a specific material resists the flow of heat. Higher the R-Value higher resistance in heat flow.

R-Value =  $\Delta T \times \text{Area} \times \text{time} / \text{Heat loss} = \text{F ft}^2 \text{ hr} / \text{Btu}$  or M<sup>2</sup> K/ W

U- Value is just opposite of R-Value; it is related with thermal conductivity.

W/M<sup>2</sup> .K is a unit of U-value, 1/R- Value also represents U-value.

- 2) What are various advantages of using thermal insulation materials in buildings?

Answer: -

- a) Reduce the fuel consumption in power plants.



- b) Reduce the emission of harmful gases
- c) Improve the quality of living.
- d) Reduce the amount of energy required for heating or cooling.
- e) Make a stable temperature inside the building.

3) Write a short note on conduction.

Convection is a transfer of heat related to the movement that occurs within a fluid due to the rising of hotter materials paired with the sinking of colder materials. This occurs because hotter materials have less density than colder ones. It has two types: natural and forced.

$$Q = h A (T_s - T_f)$$

### Section – C

03X03 = 09 Marks

1. Drive the expression for heat transfer through a plane composite wall.

Answer: -

Thermal resistances are added in the same way as electrical resistance.

So total resistance heat transfers through a plane composite wall as follows.

$$\frac{1}{R_{net}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$Q = \frac{\Delta T}{\Sigma R}$$

put the value of R in in above equation, then total heat transfer will be

$$Q = \frac{T_1 - T_4}{R_1 + \frac{1}{\frac{1}{R_2} + \frac{1}{R_3}} + R_4}$$

$$Q = \frac{T_1 - T_4}{\frac{x_1}{k_1 \cdot A} + \frac{1}{\frac{x_2}{k_2 \cdot A} + \frac{x_3}{k_3 \cdot A}} + \frac{x_4}{k_4 \cdot A}}$$

2. Write a short note on following

- 1. EPS
- 2. XPS

Answer: -

EPS: -

The expanded polystyrene foam (EPS) – was invented in Germany by the engineers of IG Farbenindustrie AG in 1950. Using pentane as a foaming agent the polystyrene granulate is supplied with water vapour. As the temperature rises



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the grains of the raw material grow soft and the effects of the pentane results in a 20-50-fold increase in the volume of the pearls.

To create an usable and saleable product a technology for making blocks was needed. Researchers noticed that after the foaming procedure the surface of the cooled polystyrene pearls becomes solid, the foaming agent contracts, so air is able to infiltrate the cells. When the blocks are rested for a few days the water vapour added during the steaming evaporates.

### XPS: -

Extruded polystyrene insulation. The first polystyrene foam was produced in 1941 by Otis Ray McIntire (1918-1996), an engineer of the Dow Chemical Company. He heated the milkwhite polystyrene granulate up to 200°C in an extruder using a chlorinated hydrocarbon (chloromethane) as a foaming agent. He led the polystyrene foam through a narrow aperture which resulted in extruded polystyrene (XPS) panels with a 98% closed cellular structure.

The first polystyrene insulating product was put on the market by the company in 1943 under the name of Styrofoam.

3. Consider a 3-m-high, 5-m-wide, and 0.3-m-thick wall whose thermal conductivity is  $k = 0.9 \text{ W/m}\cdot\text{K}$ . On a certain day, the temperatures of the inner and the outer surfaces of the wall are measured to be 16°C and 2°C, respectively. Determine the rate of heat loss through the wall on that day.

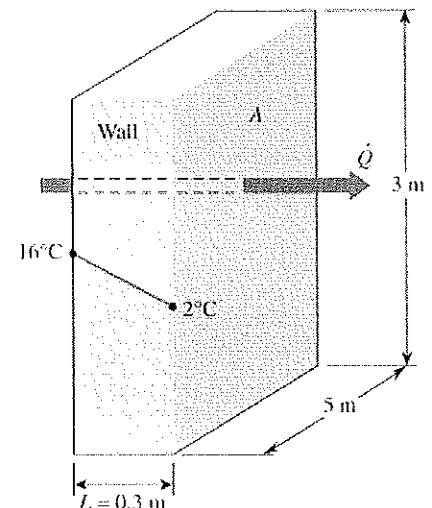
### Answer: -

Noting that heat transfer through the wall is by conduction and the area of the wall is  $A = 3 \text{ m} \times 5 \text{ m} = 15 \text{ m}^2$ , the steady rate of heat transfer through the wall can be determined

$$Q = k \cdot A \frac{(T_1 - T_2)}{L}$$

$$Q = (0.9 \text{ W/m}\cdot\text{°C})(15 \text{ m}^2) \frac{(16 - 2)}{0.3 \text{ m}}$$

$$= 630 \text{ W}$$



*Handwritten signatures and initials.*





**School of RAC Skills**  
**Session: 2020-21 (Summer Semester)**  
**B. Voc. Program, IIIrd Semester,**  
**2<sup>nd</sup> In-Sem. Examination**

**Set A**

**Course Code: HVA1305**

**Course Name: Electrical & Electronics Safety Testing**

**Time: 1 Hour**

**Max. Marks: 20**

**Instruction:**

1. Attempt all Questions.
2. Each question of Section – A carries 01 mark.
3. Each question of Section – B carries 02 mark.
4. Each question of Section – C carries 03 mark.

**Section – A**

05X01 = 05 Marks

1. What is VPP?
  - a. Voluntary Protection Plans
  - b. Voluntary Protection Plus
  - c. Voluntary Perfection Plans
  - d. Very Protection Plus
2. Benefits of health and safety programs are improvements in :
  - a. Product
  - b. Process
  - c. Service quality
  - d. All of the above
3. Safety rules can help prevent hazards associated with the use of hand and power tools?
  - a. 1
  - b. 2
  - c. 5
  - d. 4
4. Most preferred control measures are :
  - A. PPE
  - B. Administrative controls
  - C. Isolate
  - D. Eliminate



5. Management leadership includes:

- A. Creates a culture of safety
- B. facilitate trust
- C. Reinforce the core elements
- D. All of the above

**Section – B**

03X02 = 06 Marks

1. What are types of Inductor.
2. Define Self Inductance.
3. What are indirect costs of and accident in health and safety programs.

**Section – C**

03X03 = 09 Marks

1. Explain any three elements of health and Safety programs.
2. What are the Hazards of Hand Tools?
3. Methods to prevent/control workplace hazards

*Pr Singh*



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School of RAC Skills

III Semester, 2<sup>nd</sup> In-Sem. Examination

B. Voc. Program, Summer Semester (2020-21)

Answer Key

Set A

Course Code: HVA1305

Time: 1 Hour

Course Name: Electrical & Electronics safety testing

Max. Marks: 20

Section – A

05X01 = 05 Marks

1. What is VPP:

a. Voluntary Protection plans

2. Benefits of health and safety programs are improvements in

d. All of the above

3. Safety rules can help prevent hazards associated with the use of hand and power tools?

c. 5

4. Most preferred control measures are

d. Eliminate

5. Management leadership includes

D. All of the above.

Section – B

03X02 = 06 Marks

1. What are types of inductor.

Answer Air-core Inductor.

Iron-Core Inductor.

Toroidal Inductors. ...

Laminated Core Inductors. ...

Powdered Iron Core Inductors.



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2. Define Self Inductance.

**Answer** Self inductance is defined as the induction of a voltage in a current-carrying wire when the current in the wire itself is changing

3. What are indirect costs of and accident in health and safety programs.

**ANSWER:**

Schedule delay.

Lower morale.

Increased Absenteeism.

Poor Customer Relations.

Re-training

### Section – C

03X03 = 09 Marks

1. Explain any three elements of health and Safety programs

**Answer** 1. Management Leadership: Creates a culture of safety, facilitates trust.

Workers participation: Results in better design

Hazard Identification and Assessment: Identifies and document all known and suspected hazards.

2. What are the Hazards of Hand Tools?

**Answer:** Hand tools are tools that are powered manually. Hand tools include anything from axes to wrenches. The greatest hazards posed by hand tools result from misuse and improper maintenance.

Some examples include the following:

If a chisel is used as a screwdriver, the tip of the chisel may break and fly off, hitting the user or other employees.



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3. Methods to prevent/control workplace hazards

Answer : **Benefits of effective controls**

Protect workers from hazards

Help avoid injuries, illnesses, and incidents

**Involve workers**

Understand conditions that create hazards

Insights into how hazards can be controlled

*Rough*

