Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Set - A

School of RAC Skills

III Semester, 1st In-Sem. Examination

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

Course Code: HVA1301 Time: 1 Hour

Course Name: Refrigerant & Psychrometry 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. Condensing temperature in a Refrigerator is the temperature:

   a. Of cooling medium
   b. Of freezing zone
   c. Of evaporator
   d. At which refrigerant gas becomes liquid

2. Which of the following refrigerant has the highest freezing point?

   a. Ammonia
   b. Carbon dioxide
   c. Sulphur dioxide
   d. R-12

3. Which of the following is an azeotrope refrigerant?

   a. R-11
   b. R-40
   c. R-114
   d. R-502

a. COP of the system
b. Heat transfer
c. Environment
d. All of the above

4. The ozone friendly refrigerant R-134a contains:

a. One Chlorine atom
b. Two Chlorine atom
c. Four Chlorine atom
d. No Chlorine atom

5.What is the refrigerant number for the chemical formula CCl_3F?

a. R-12
b. R-11
c. R-134a
d. None

Section – B

03X02 = 06 Marks

1. What is the degree of superheat and sub-cool and where these phenomena take place in a refrigeration cycle?
2. Define the term refrigerant.
3. Which component of refrigeration system is of greatest size? Give the explanation.

Section – C

03X03 = 09 Marks

1. Describe VCRS in detail with a neat sketch.
2. Write down a note on stratospheric layer depletion.
3. Describe the classification of refrigerant.

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BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of RAC Skills

III Semester, 1st In-Sem. Examination

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

ANSWER KEY

Course Code: HVA1301 Time: 1 Hour

Course Name: Refrigerant & Psychrometry Max. Marks: 20

Section – A

05X01 = 05 Marks

1. Condensing temperature in a Refrigerator is the temperature:

   d. At which refrigerant gas becomes liquid

2. Which of the following refrigerant has the highest freezing point?

   b. Carbon dioxide

3.Which of the following is an azeotrope refrigerant?

   d. R-502

4. The refrigerant affects _____.

   a. COP of the system

4. The ozone friendly refrigerant R-134a contains:

   d. No Chlorine atom

5.What is the refrigerant number for the chemical formula CCl_3F?

   b. R-11

Section – B

03X02 = 06 Marks

1. What is the degree of superheat and sub-cool and where these phenomena take place in a refrigeration cycle?

   ANSWER: Degree of superheat= Actual measured temperature of vapor/steam - Saturated temperature of vapor/steam.

   Degree of sub-cool= Saturated liquid temperature – Actual measured temperature.

2. Define the term refrigerant.

   ANSWER: Heat carrying medium which flows inside the cycle.

3. Which component of refrigeration system is of greatest size? Give the explanation.

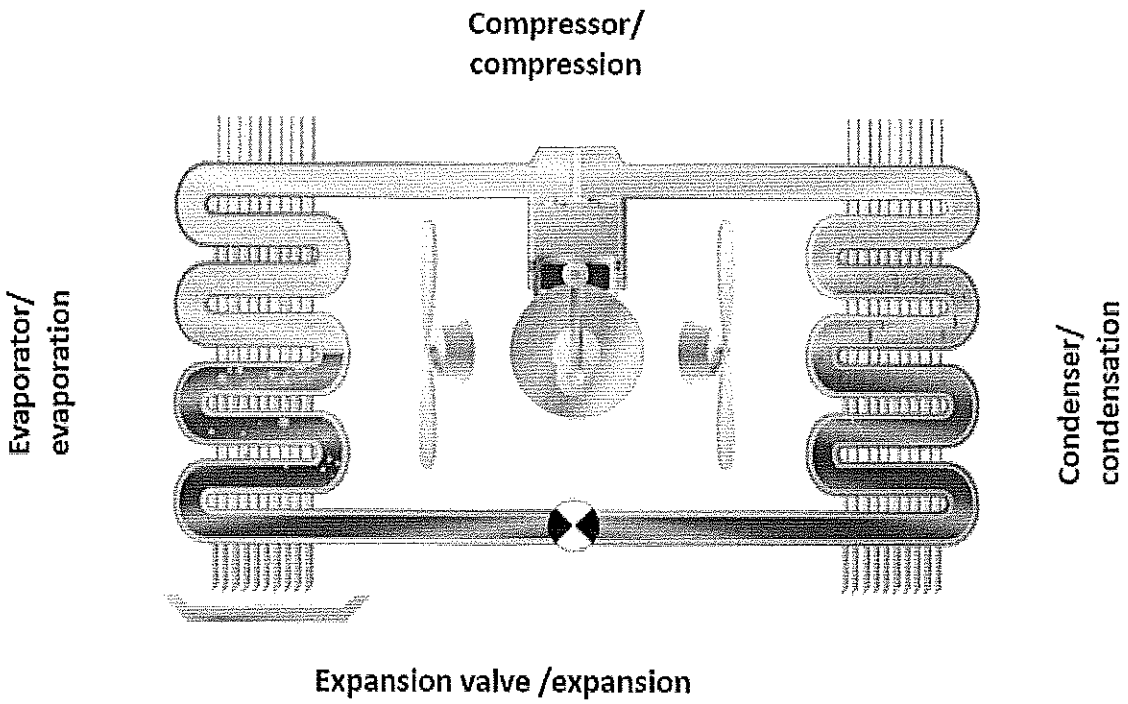
   ANSWER: Condenser

   Heat rejected by condenser= Heat from evaporator+ Heat from compressor

Section – C

03X03 = 09 Marks

1. Describe VCRS in detail with a neat sketch.



2. Write down a note on stratospheric layer depletion.

Answer:

OZONE DEPLETION PHENOMENON:

Definition:

Ozone depletion is the phenomena that occur when destruction of the stratospheric ozone is more than the production of the molecule. The scientists have observed reduction in stratospheric ozone since early 1970s. It is found to be more prominent in polar Regions. Following is the set of chemical equations describing Ozone Depletion:

$CFCl_3 + UV\ Light \rightarrow CFCl_2 + Cl$

$Cl + O_3 \rightarrow ClO + O_2$

$ClO + O — Cl + O_2$

The free chlorine atom is then free to attack another ozone molecule:

$Cl + O_3 — ClO + O_2$

$ClO + O — Cl + O_2$

3. Describe the classification of refrigerant.

Answer: Chlorofluorocarbons (CFCs)

Hydrochlorofluorocarbons (HCFCs)

Hydrofluorocarbons (HFCs)

Hydrocarbons (HCs)

Najmul Haque

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of RAC Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program III Semester,

1st In-Sem. Examination

Course Code: HVA1302 **Time: 1 Hour**

Course Name: Compressor Condenser Evaporator **Max. Marks: 20**

Instruction: (if any)

Section – A

05X01 = 05 Marks

1. Which oil is most suited with R134a?
   (a) PAG
   (b) Mineral oil
   (c) Ab
   (d) POE
2. What is main function of compressor?
   (a) Increase temperature
   (b) Convert liquid into gas
   (c) Exchange heat
   (d) None of them
3. What is the main function of evaporator?
   (a) Increase pressure
   (b) Heat Exchange
   (c) Condense the vapour
   (d) None of them
4. Diaphragm type compressor is a type of?
   (a) Reciprocating Compressor
   (b) Rotary Compressor
   (c) Axial Compressor
   (d) Centrifugal Compressor
5. Plate in tube type heat exchange is a type of?
   (a) Compressor
   (b) Condenser
   (c) evaporator
   (d) Both compressor and evaporator

Section – B

03X02 = 06 Marks

1. Write a short note on reciprocating compressor
2. What are the various disadvantages of using natural convection type condenser?
3. How does condenser work, explain with diagram?

Section – C

03X03 = 09 Marks

1. Write a note on different terminologies used in compressors.
2. Explain the all types of rotary compressor.
3. Explain any three types of evaporator used in domestic and commercial refrigerator.

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Set – A

Registration No.: .....

School of RAC Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program III Semester,

1st In-Sem. Examination

Time: 1 Hour

Course Code: HVA1302

Max. Marks: 20

Course Name: Compressor Condenser Evaporator

Instruction: (if any)

Answer Sheet A

Section – A

05X01 = 05 Marks

1. Which oil is most suited with R134a?

   (d) POE

2. What is main function of compressor?

   (d) None of them

3. What is the main function of evaporator?

   (b) Convert liquid into gas

4. Diaphragm type compressor is a type of?

   (A) Reciprocating Compressor

5. Plate in tube type heat exchange is a type of?

   (C) evaporator

Section – B

03X02 = 06 Marks

1. Write a short note on reciprocating compressor

Reciprocating Compressor has piston, cylinder, inlet valve, exit valve, connecting rod, crank, piston pin, crank pin and crank shaft. Inlet valve and exit valves may be of spring loaded type which get opened and closed due to pressure differential across them. Let us consider piston to be at top dead centre (TDC) and move towards bottom dead centre (BDC). Due to this piston movement from TDC to BDC suction pressure is created causing opening of inlet valve. With this opening of inlet valve and suction pressure the atmospheric air enters the cylinder. 5 Air gets into cylinder during this stroke and is subsequently compressed in next stroke with both inlet valve and exit valve closed. Both inlet valve and exit valves are of plate type and spring loaded so as to operate automatically as and when sufficient pressure

difference is available to cause deflection in spring of valve plates to open them. After piston reaching BDC it reverses its motion and compresses the air inducted in previous stroke. Compression is continued till the pressure of air inside becomes sufficient to cause deflection in exit valve. At the moment when exit valve plate gets lifted the exhaust of compressed air takes place. This piston again reaches TDC from where downward piston movement is again accompanied by suction. This is how reciprocating compressor. Keeps on working as flow device. In order to counter for the heating of piston-cylinder arrangement during compression the provision of cooling the cylinder is there in the form of cooling jackets in the body. Reciprocating compressor described above has suction, compression and discharge as three prominent processes getting completed in two strokes of piston or one revolution of crank shaft

2. What are the various disadvantages of using natural convection condenser?

Natural convection type condenser save cost, because it does not use mechanical fan or another device to for condensing. But at the same time it occupy lot of space. To understand this lets take an example of wire and tube type condenser used in refrigerator. It has a large size for very less cooling effect. If we compare the size with the forced cooled condenser then, with very less size it can provide two to three time more cooling effect. So natural convective type condenser are not efficient in term of area to provided cooling ratio. Also rate of heat transfer is also low.

3. How does condenser work, explain with diagram?

When the heat is absorbed by the evaporator, it passes through the compressor, is compressed to a higher pressure, then passes to the condenser.

With the higher pressure, the boiling point of the refrigerant is raised to above the outdoor ambient temperature/pressure. Sensible heat (superheat) that has been added to the gas by the heat of compression begins to bleed off the refrigerant until it reaches a temperature that corresponds to the pressure at which it can condense. At that time, the refrigerant condenses. Here both gas and liquid are present. The refrigerant is now called saturated. The liquid/gas mix at this point will not change in temperature but will change its state to a liquid. The vast majority of the heat is released during this phase.

Once the latent heat has been removed, there will be no more gas in the pipe. The liquid then can subcool. The last few passes of the condenser will release sensible heat before it travels to the expansion device.

The video below gives a representation of how the condenser works.

Section – C

03X03 = 09 Marks

1. Write a note on different terminologies used in compressors

1. Suction Pressure: Pressure at which refrigerant enters into the compressor.
2. Discharge Pressure: Outlet pressure of Compressor
3. Critical Pressure: the critical pressure is defined as the pressure above which liquid and gas cannot coexist at any temperature.
4. Critical Temperature: The critical temperature of a substance is the temperature at and above which vapor of the substance cannot be liquefied, no matter how much pressure is applied.
5. Compressibility: the capacity of something to be flattened or reduced in size by pressure.
6. Compression Ratio: compressor ratio is the ratio of absolute discharge pressure or head pressure to the absolute suction Pressure.
7. Volumetric Efficiency: It is the ratio of actual weight of refrigerant in a cylinder to the weight that the cylinder can theoretically hold.
8. Duty Cycle: Duty cycle refers to the amount of time a compressor can be operated in a given time period at 100 PSI, and a standard ambient temperature of 72° F. It is commonly expressed in percentage format:
9. Compressor on time ÷ (on time + off time) = Duty Cycle %.
10. Swept Volume: Swept volume is the displacement of one cylinder. It is the volume between top dead center (TDC) and bottom dead center (BDC).

2. Explain the all types of rotary compressor

Rotary screw compressors

It uses two Asymmetrical rotors that are also called helical screws to compress the air. The rotors have a very special shape and they turn in opposite directions with very little clearance between them. The rotors are covered by cooling jackets. Two shafts on the rotors are placed that transfer their motion with the help of timing gears that are attached at the starting point of the shafts/compressor.

Working principle-Air sucked in at one end and gets trapped between the rotors and get pushed to other side of the rotors. The air is pushed by the rotors that are rotating in

opposite direction and compression is done when it gets trapped in clearance between the two rotors. Then it pushed towards pressure side.

Rotary screw compressors are of two types oil-injected and oil-free.

Oil-injected is cheaper and most common than oil-free rotary screw compressors.

Advantages

- Less noisy.
- These are called the work-horses as they supply large amount of compress air.
- More energy efficient as compared to piston type compressors.
- The air supply is continuous as compared to reciprocating compressors.
- Relatively low end temperature of compressed air.

Disadvantages

- Expensive then piston-type compressors.
- More complex design.
- The maintenance is very important
- Minimum one day use is important in a weak to avoid rusting.

Rotary scroll compressor

They are one of the best compressor type in rotary compressors. The air is compressed using two spiral elements. One element is stationary and the other one moves in small eccentric circles inside the spiral. Air gets trapped inside the spiral way of that element and get transported in small air-pockets to the center of the spiral.

Simply air gets trapped at the outer edge and get compressed due to reduction of are as it travels from outer edge to inner edge. It takes about 2 to 3 turns for the air to reach the pressure output in the center.

Advantages

- Very quiet.
- This is very compact in size.
- Simple design with not so many parts.
- Oil-free design and low maintenance.

Disadvantages

Output capacity is low.

Relatively expensive

You have to buy a new scroll element with the failure of older one even if there is not any big problem.

The temperature of compressed air is too much high.

Vane Type Rotary Compressor

This is an another type of rotary compressor. There is a fixed casing in Vane type compressor in which a rotary rotor disc is placed which has slots that are used for holding the sliding plates.

Whenever rotor rotates the disc also rotates thus allowing the sliding plates to slide as the inner surface of casing is eccentric. Whenever the plates moves away from the center a huge amount of air get trapped inside it and with the rotation the sliding plates converge due to its shape and the trapped air get compressed. This results in compression of air.

Advantages

Easy maintenance.

Simple in design.

Lobe Type Air Compressor

This is one of the simpler compressor type. In this there is no complicated moving part. There are two lobes attached to the driving shaft by the prime mover. These lobes are displaced with 90 degrees to one another. Thus if one of the lobe is in horizontal direction the other lobes will be exactly positioned at 90 degree i.e in vertical direction.

The air gets trapped from one end and as the lobes rotates the air gets compressed as shown in image. The compressed air is then delivered to delivery line.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of RAC Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 3rd Semester,

1st In-Sem. Examination

Course Code: HVA-1303 **Time: 1 Hour**

Course Name: Air Distribution **Max. Marks: 20**

Instruction: Attempt all questions

SET-A

Section – A

05X01 = 05 Marks

1. Mean radiation temperature depends on:
   a. Mean Radiant temperature.
   b. Average skin temperature
   c. Surface emissivity
   d. All of the above
2. Each pound of air at sea level at standard atm pressure and at 70°F can hold:
   a. 110.5 grains of moisture
   b. 80.6 grains of moisture
   c. 90 grains of moisture
   d. 200.15 grains of moisture
3. If moisture content remains the same and dry-bulb temperature drops the RH:
   a. Increases
   b. Decreases
   c. Remains constant
   d. None of the above
4. What is the thermal comfort situation for humans?
   a. 30 % RH
   b. 70 % RH
   c. 55 % RH
   d. All of the above
5. What speed is considered a draft:
   a. Above 40 fpm
   b. Below 40 fpm
   c. Above 70 fpm
   d. Below 30 fpm

Section – B

03X02 = 06 Marks

6. Define Dry bulb temperature and wet bulb temperature.
7. What are the factors that affect thermal comfort?

8. What are the thermal comfort conditions?

Section – C

03X03 = 09 Marks

9. What is the importance of air and air flow?
10. What is the difference between all heat rejection mechanisms in humans?
11. What is the difference between absolute and relative humidity?

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School of RAC Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 3rd Semester,

1st In-Sem. Examination

Course Code: HVA-1303 **Time: 1 Hour**

Course Name: Air Distribution **Max. Marks: 20**

Instruction: Attempt all questions

SET-A A.K.

Section – A

05X01 = 05 Marks

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

Section – B

03X02 = 06 Marks

6. The Dry Bulb temperature, usually referred to as *"air temperature"*, is the air property that is most commonly used. When people refer to the temperature of the air they are normally referring to the dry bulb temperature. The **Wet Bulb** temperature is the adiabatic saturation temperature.

   Wet Bulb temperature can be measured by using a thermometer with the bulb wrapped in wet muslin.

7. Factors affecting the heat exchange:
   a. Absolute and Relative humidity (RH)
   b. Dry Bulb Temperature
   c. Thermal Radiation
   d. Air movement (fpm)
   e. Insulation value of clothing (clo)
   f. Activity Level (met)
   g. Direct contact with surfaces not at a body temperature.

8. Comfort is a feeling of physical contentment with the environment. For Humans it is at 73°F and 50-55 % RH

Section – C

03X03 = 09 Marks

9. Understanding importance of air and airflow is necessary to troubleshoot and maintain an HVACR system.
   a. Factors affecting airflow will affect system performance.

b. Most properties responsible for human comfort are all dependent on air.
c. Fresh Air flow is necessary to maintain oxygen level in a space.
d. The fresh air mixes with the room air to create comfortable atmosphere in that space.

10. Radiation occurs when we get close to a object colder than our body temperature. Convection accelerates the cooling process by movement of cool air over the body. Evaporation is a slow process. It requires body to produce perspiration and the surrounding to be able to absorb water.

11. Actual amount of water that is contained in the air is called absolute humidity. RH is the relationship between weight of water vapor in a pound of air compared to the weight of water vapor that a pound of air could hold if it was 100% saturated. RH is used to determine air conditions, operating effectiveness and efficiency of a HVAC system.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

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Registration No.: .....

Set + A

School of RAC Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program III Semester,

1st In-Sem. Examination

Course Code: HVA1304 **Time: 1 Hour**

Course Name: Thermal Insulation **Max. Marks: 20**

Instruction: (if any)

Section – A

05X01 = 05 Marks

1. Which insulation Material has highest working temperature?
   (a) Foam Glass
   (b) Glass Fiber
   (c) Fire Brick
   (d) Cellulose Insulation
2. Why do we use use insulation in building?
   (a) To save money
   (b) To provide comfort
   (c) To reduce power requirement
   (d) All of above
3. What is unit of thermal conductance?
   (a) W/K
   (b) W/ m K
   (c) K/W. M
   (d) K W /K
4. What is the unit of PERM?
   (a) 1 Grain/ hr ft in-Hg
   (b) 1 Grain/ hr ft2 in-Hg
   (c) 1 Grain/ ft2 in-Hg
   (d) 1 Grain/ hr ft2 Hg
5. What is the full form of EPS?
   (a) Extruded polyethylene insulation
   (b) Extruded polystyrene insulation
   (c) Expanded Polystyrene insulation
   (d) Expanded Polyethylene insulation

Section – B

03X02 = 06 Marks

1. Write a short note on cellulose insulation?
2. What are the various advantages of using thermal insulation In Buildings?
3. How heat transfer occur in metals, explain briefly?

Section – C

03X03 = 09 Marks

1. Drive the equation for heat transfer in composite wall.
2. Write a short note on history of insulation
3. Explain the manufacturing process of following insulation material
   a) Foam Glass Insulation
   b) Glass Wool Insulation

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Registration No.: .....

School of RAC Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program III Semester,

1st In-Sem. Examination

Course Code: HVA1304

Course Name: Thermal Insulation

Instruction: (if any)

Time: 1 Hour

Max. Marks: 20

Answer Sheet A

Section – A

05X01 = 05 Marks

1. Which insulation Material has highest working temperature?
   (a) Fire Brick
2. Why do we use use insulation laying in building?
   (a) All of above
3. What is unit of thermal conductance?
   (a) W/K
4. What is the unit of PERM?
   (a) 1 Grain/ hr ft2 in-Hg
5. What is the full form of EPS?
   (a) Expanded Polystyrene insulation

Section – B

03X02 = 06 Marks

1. **Write a short note on cellulose insulation?**

Cellulose Insulation:

It is one of the first used insulation. Cellulose is organic natural foam. Sugar, wood, cotton, newspaper, straw, sawdust all are made of cellulose. To make cellulose insulation we recycle or/and reuse newspaper, sawdust etc.
Cellulose insulation is available in many foams according to major applications:

Dry cellulose (loose fill)
Spray-applied cellulose (wet-spray cellulose)
Stabilized cellulose
Low-dust cellulose

Dry cellulose (loose fill):

This type of insulation mainly used in retrofitting application. Dry loose insulation is filled in drilled holes or cavities up to required thickness. Water is not added into dry cellulose insulation. Settling is always major problem with cellulose insulation
Dense-packed insulation is preferable option to minimize settling problems

Wet-spray Insulation:

In wet spray insulation we add some water or moisture retardant or some adhesive. Wet- spay insulation can be install without need of retainers. It provide less settling and better sealing.

Stabilized cellulose

Stabilized cellulose is used most often in attic/roof insulation. It is applied with a very small amount of water to activate an adhesive of some kind. This reduces settling and decreases the amount of cellulose needed.

This can prove advantageous at reducing the overall weight of the product on the ceiling drywall helping prevent possible sag.

Low-dust cellulose

high levels of dust are created during application of most types of dry insulation This kind of cellulose has a small percentage of oil or similar dust dampener added.

2. **What are the various advantages of using thermal insulation In Buildings?**

Thermal Insulation:

It is a process of retarding or reducing flow of heat between/among objects kept in thermal contact (conduction, convection, radiation).

Regardless temperature it prevent heat flow from atmosphere to room and from room to atmosphere.

Advantage of thermal Insulation

- Insulation is a part of our daily life.
- We use insulation on electric wires.
- We use insulation on roof to make it water proof for rainy season.
- We use brick insulation to reduce heating of home form sun radiation.
- In summer and we use insulation on roofs to make a stable temperature.

3. **How heat transfer occur in metals, explain briefly?**

Conduction is actually a process which takes place on an atomic-particle level. In metals, thermal conduction results from the motion of free electrons (similar to electrical conduction). In liquids and poorly conducting solids, oscillation of the molecular lattice is reason of conduction. In gases, conduction occurs through collisions between molecules.

The overall effects of conduction heat transfer can be described on a much larger scale. Experiments have shown that the rate of heat flow is proportional to the temperature difference across an object and the area available for heat to flow through (perpendicular to the direction of heat flow), but inversely proportional to the thickness of the object. It show how rapid heat can transfer through the an object of unit area and thickness when temperature difference is 1° C.

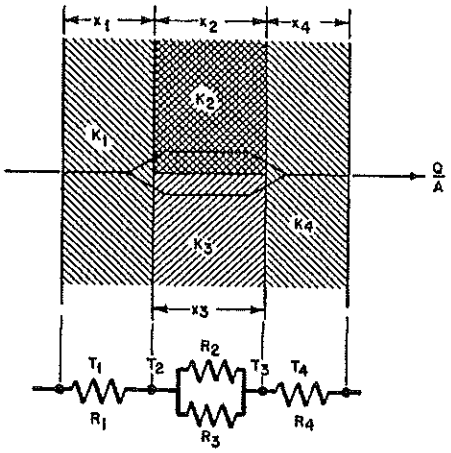
$$Q = k A T_1 - T_2 / X$$

Section – C

03X03 = 09 Marks

1. **Drive the equation for heat transfer in composite wall.**

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



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

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

then total heat transfer will be

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

2. **Write a short note on history of insulation**

History of Thermal Insulation:

Early historic insulation
Natural
Artificial

Since stone age to 21 century human always has need for thermal insulation materials, in term of house and clothing. In stone age homes were made of earth or caves. Historian believe that first of all Asbestos was found by Greek and Romans to get Resistance against fire and heat. Later on Romans found cork and they used it for roof and even for shoes. Cork were mixed in clay and used for walls by North Africans.

As the technology developed, it also innovate new methods and materials for thermal insulation.

In North Europe thatched huts had roof of 2ft thick made of woven straw and clay. Later on eel grass were also used for roof insulation.

Mineral wool also a new improvement in insulating material. It was first used by natives of Hawaiian island. This material is come from volcanic deposit. In late 19 century industrial revolution had started. Cobot's Quilt Is a blanket type insulation and has a sandwiched or stitched structure. It is develope throughout 1890.

Mineral wool was first commercially produced as a pipe insulated in Wales in 1840. IN USA it was produced in 1875. After further refinement Rock Wool was produced in 1897.

Fiberglass had its first beginnings in ancient Egypt, when people discovered that they could draw hot glass into threads, The modern technique of making fiberglass insulation, developed in 1931, involves jetting of molten glass through tiny heated holes into high-speed air streams, wherein the resulting fibers are drawn very thin and to great length. Developed by Owens-Illinois, the Corning Glass Company was the sole producer of this material.

Extruded polystyrene insulation originally was developed by the Dow Chemical Company in the United States in the early 1940s.

Known proprietary as Styrofoam, it was first used as a flotation material in life-rafts and lifeboats because its fully closed cell structure renders it highly resistant to water absorption. The insulating properties of Styrofoam, combined with the advantage of

the closed cell structure, led to its development as a thermal insulation material. Initial applications were in low-temperature situations for cold-store floors, wall, and ceiling panels and pipe insulation.
New material such as phenolic foam, Cementitious foam, calcium silicate, perlite etc. were invented.

6. **Explain the manufacturing process of following insulation material**

a) **Foam Glass Insulation**

Foam Glass:
Very fist method of making it was invented in 1931 using silica with 20% combustible material (lignite, coal, wood) and foaming agents (hydrochloric acid, sodium hydroxide solution). This mixture was heated to 1500°C resulting in a porous product. Foam glass has an operating temperature range of -200 to 430 °C.

Manufacturing Process:
1. Batching Process: In this process we mix a standard ration of various raw materials like Recycle Glass, iron oxide etc. Recycled Glass has almost 80% of raw material.

2. Melting: Here Batch is being melted up to required temperature which has range of 800- 1500°C.
3. Ball mill: This material send into ball mill which converts it into fine powder, here we also add carbon black

4. Forming: Now this material send to forming process at 850°0C. Here it gets its shape.
5. Curing Oven: To reduce thermal stress,, which increase life of product and its thermal resistance.

6. Packing and storage: Required size of material cut and storage in storage cell.

Advantages

It also provide acoustic insulation.
It is eco-friendly
Water resistant.
Inert with chemicals.
Long life

Disadvantages

High Cost.
Can not stand longer against vibration.
High installation cost

b) **Glass Wool Insulation**

Glass Wool:

Sometimes Glass wool is considered as a type of mineral wool. It is made of quartz, sand, limestone, dolomite and 50- 60% recycled glass. Manufacturing process is almost as rock wool. Molten Glass is spun at a very high speed and foam fibres. In 1893 Edward Drummond Libbey (1854-1925) experimented with glass fibres with the diameters as fine as silk fibres, with the first fibreglass insulation being introduced in 1938 by Russell Games Slayter (1896-1964).

Manufacturing Process:

1. Batch: glass wool is made mainly of sand, soda-ash, limestone and recycled glass; stored in silos, they are weighed, mixed and poured into a furnace.

2. Melting: the mixture is then melted at a temperature exceeding 1,400°c in an electric or gas furnace.

3. Fiberizing: the liquid glass passes via a feeder to a Fiberizing machine, where it is propelled through tiny holes by a centrifugal spinner-creating the fibres. These are sprayed with a binder and shaped into a blanket.

4. Forming: then the blanket passes through a curing oven. During this process, the blanket can be compressed to achieve its final thickness.

5. Cutting: the blanket is then cut to the required width. Off-cuts are recycled. A facing can eventually be glued to the blanket.

6. Packaging: The end of the line is generally equipped with a rolling machine for mats and a stacking machine for boards.

7. Palletization: The glass wool can be compressed to up to a tenth of its volume. A total of 36 rolls of glass can be packed onto a single pallet. After palletization material is send to stores.

Applications:

. Loft or attic insulation.
. Cavity wall insulation.
. Sound insulation (absorption) within floors and partitions.
. Thermal and acoustic insulation of pipe work in heating and ventilation,
. air-conditioning and industrial applications.

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School of RAC Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, IIIrd Semester,

1st In-Sem. Examination

Set A

Course Code: HVA1305 **Time: 1 Hour**

Course Name: Electrical & Electronics Safety Testing **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. Definition of Hazard?

   a. Anything that can cause harm
   b. Use of Equipment
   c. Use of Tools
   d. Measurement of risk

2. Type of Chemical Hazard:

   a. Noise
   b. Tools
   c. Welding
   d. None of the above

3. Biological Hazards Include?

   a. Virus
   b. Bacteria
   c. Insects
   d. All of the above

4. Most preferred control measures are :

   A. PPE
   B. Administrative controls
   C. Isolate
   D. Eliminate

5. Example of PPE:

A. hand gloves

B. insects

C. Radiation

D. Bacteria

Section – B

03X02 = 06 Marks

1. Calculate total capacitance value connected in series: 2µF, 5µF and 15µF.
2. Calculate total capacitance value connected in parallel:1µF, 2µF and 3µF.
3. What is Risk and Hazard? Explain by giving Examples.

Section – C

03X03 = 09 Marks

1. Explain the hierarchy of controls.
2. What are the possible causes of risk?
3. Explain the safety hazards with examples.

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

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III Semester, 1st In-Sem. Examination

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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. Definition of Hazard:

   a. Anything that can cause harm

2. Type of Chemical Hazard

   d. None of the above

3. Biological hazard includes

   d. None of the above

4. Most preferred control measures are

   d. Eliminate

5.example of PPE

   A. Hand Gloves

Section – B

03X02 = 06 Marks

1. Calculate total capacitance value connected in series: 2μF, 5μF and 15μF.

   Answer $1/C_{TOTAL}=1/C_1+1/C_2+1/C_3= 1/2+1/5+1/15$

   $=0.5+0.2+0.066=0.766\mu F$

2. Calculate total capacitance value connected in parallel:1μF, 2μF and 3μF.

   Answer $C_{TOTAL}=C_1+C_2+C_3= 1+2+3$

   $=6\mu F$

3. What is Risk And Hazard.Explain by giving examples

ANSWER: Hazard - A hazard is something that can cause harm,

Risk - A risk is the chance, high or low, that any hazard will actually cause somebody harm.

For Ex. Slippery surface is the hazard and slip on that and have major injury is the risk.

Section – C

03X03 = 09 Marks

1. Explain Hierarchy of Controls

Answer Hierarchy of controls includes:

Eliminate : Physically remove the hazard.

Substitute: Replace the hazard

Engineering controls : Isolate people from hazard.

Administrative controls: Change the way people work.

PPE: Protect the worker with personal protective equipments.

2. What are the possible causes of risk?

Answer: Possible causes of risk are:
Fire
Slips and trips,
Electrical hazard,
Chemical,
back Injury,
Hazardous material,
workplace violence.

3. Explain safety hazards with examples.

Answer : These are hazards that create unsafe working conditions.

For ex. inappropriate machine guarding