



Registration No.: .....

**School of Refrigeration & Skills**  
**Session: 2020-21 (Summer Semester)**  
**B. Voc. 2<sup>nd</sup> Semester,**  
**1<sup>st</sup> In-Sem. Examination**

**Course Code: RAC1101**

**Time: 1 Hour**

**Course Name: Basic of Refrigeration**

**Max. Marks: 20**

**Instruction:** Write the unit clearly and do mention the steps for calculation.

Mention the units carefully.

**Section – A**

Objective type questions, each question carries 01 mark.

05X01 = 05 Marks

Q.1) The temperature at which substance change its phase Vapor to liquid or liquid to vapor is known as \_\_\_\_\_?

- a) Specific Heat
- b) Sensible Heat
- c) Latent Heat
- d) saturation

Q.2) State of the Refrigerant at Inlet of Evaporator is \_\_\_\_\_

- a) Liquid
- b) Liquid and vapor
- c) Vapor
- d) Solid

Q.3) At Temperature \_\_\_\_\_ & \_\_\_\_\_ a substance can be both Liquid and vapor?

- a) Condensation & Freezing point
- b) Condensing & Boiling point
- c) Freezing & Evaporation Point
- d) Critical point

Q4) Boiling point is a point when \_\_\_\_\_ Pressure of liquid equal to \_\_\_\_\_ pressure?

- a) Liquid & atmospheric
- b) Static pressure & Atmospheric
- c) Vapor & Atmospheric
- d) None of the above

Q5) With Increase in temperature Pressure \_\_\_\_\_?

- a) Decrease
- b) Becomes Super critical
- c) Equal to Saturation
- d) Increases

**Section – B**

03 Short answer type questions, each question carries 02 marks.

03X02 = 06 Marks

Q6) Define Boiling point?

Q7) Draw a neat sketch of Pressure gauge and mention all the pressure observed in the system?



Q8) What is thermodynamic Work unit?

**Section – C**

03X03 = 09 Marks

03 essay type questions, each question carries 03 marks.

Q.9) Define zeroth law and draw a neat sketch explaining the law?

Q10) What is the difference between point and path function?

Q11) Define first law of thermodynamics?

*Prof. Singh*  
*Q. Singh*  
*Q.*



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### Section – A

Objective type questions, each question carries 01 mark.

05X01 = 05 Marks

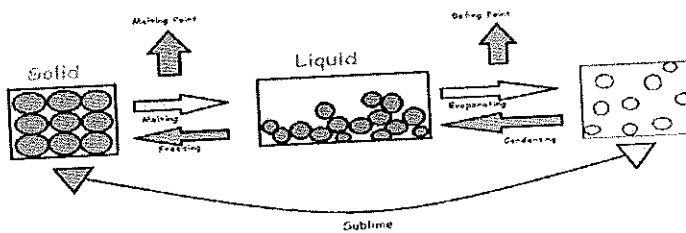
- A.1) d) Saturation
- A.2) a) Liquid
- A.3) b) Condensing & Boiling point
- A4) c) Vapor & Atmospheric
- A5) d) Increases

### Section – B

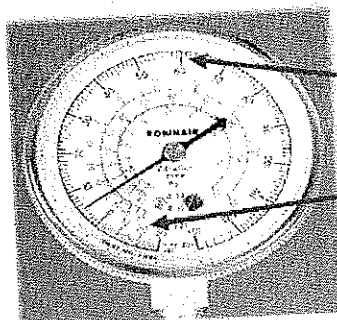
03 Short answer type questions, each question carries 02 marks.

03X02 = 06 Marks

A6) The boiling point is the temperature at which the vapor pressure of a liquid equals the external pressure surrounding the liquid. Therefore, the boiling point of a liquid depends on atmospheric pressure.



Compound Gauge

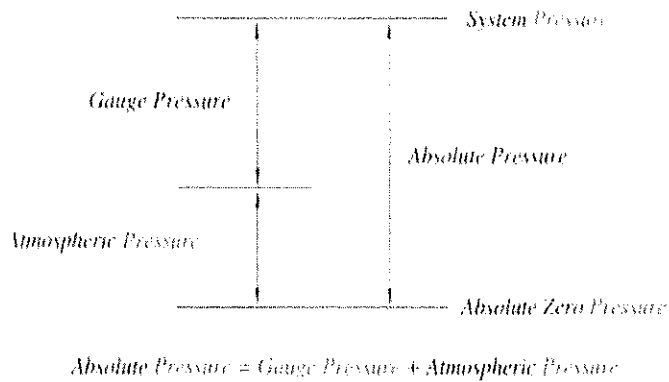


Gauge Scale:

Positive Pressure Scale

Vacuum Scale (Reference Only!)

A7)



A 8) Work is said to be done by a system if the sole effects on things external to the system can be reduced to raising of a weight.

Sign convention for work transfer:

Work done by the system is taken as positive.

Work done on the system is taken as negative.

Unit of work is **N-m or joule (1 N-m = 1Joule)**

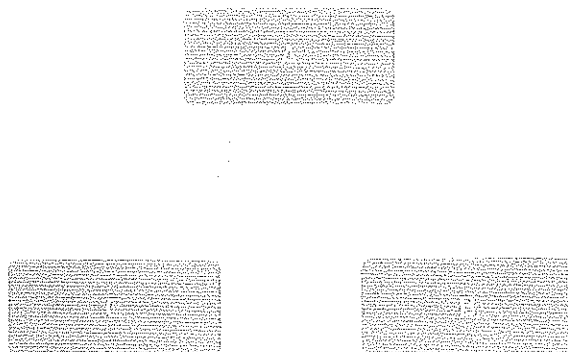
Work per unit time is **Power**, unit of power is **J/s or watt**.

**Section – C**

03X03 = 09 Marks

03 essay type questions, each question carries 03 marks.

A.9) When a body A is in thermal equilibrium with a body B and separately with a body C, then B and C will be in thermal equilibrium with each other.





A10)

Point	Path
1. They do not depend on the path followed during a process.	1. They depend on the path and not on the initial and final points.
2. Only depends on initial and final points.	2. Depends on path
3. e.g., temperature, volume, pressure, etc.	3. e.g., work, heat etc.

A 11) Law of conservation of energy: the energy can neither be created nor destroyed but only can be converted from one form to another.

For a closed system undergoing a cycle it was found,

$$\oint W = J \oint Q, \text{ Where } J \text{ is joule's equivalent.}$$

In SI units  $J = 1 \text{ Nm/Joule.}$

*hst*  
*Quigs*



**BHARTIYA SKILL DEVELOPMENT UNIVERSITY****School of RAC Skills****I Semester, 2<sup>nd</sup> In-Sem. Examination****B. Voc. Program, Summer Semester (2020-21)****Course Code: RAC1102****Time: 1 Hour****Course Name: Domestic RAC Appliances****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. Which one is the measuring instrument?

- a. Filler gauge
- b. Wire gauge
- c. Try square
- d. Measuring tape

2. Which one is the gauging instrument?

- a. Vernier caliper
- b. Micrometer
- c. Try square
- d. None of the above

3. Room ACs are based on which cycle?

- a. Carnot Cycle
- b. Reversed Carnot cycle
- c. Atkinson Cycle
- d. All of the above

4. Value of 35 micron in Millimeter (mm) is:

- a. 35 mm
- b. 350 mm
- c. 3.5 mm
- d. None of the above

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5. By which component, pressure reduction is done in your room AC?

- a. Compressor
- b. Condenser
- c. Expansion device
- d. None of the above

### Section – B

03X02 = 06 Marks

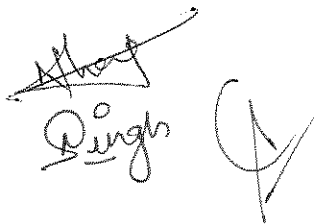
1. Define the term measurement. How measuring is different from gauging.
2. You have a Vernier Caliper of least count 0.02 mm. Minimum measurable value on main scale is 1 mm. Find out the total number of divisions on secondary scale.
3. Write down the name of basic components of air conditioner and arrange them in air conditioner cycle.

### Section – C

03X03 = 09 Marks

1. Describe the safety during AC work in detail.
2. Give the name of all the parts of a Vernier Caliper with the help of a neat sketch.
3. Explain all the processes take place in an air conditioning cycle through a neat sketch cycle.

~~Atish~~  
R Singh



**BHARTIYA SKILL DEVELOPMENT UNIVERSITY****School of RAC Skills**I Semester, 2<sup>nd</sup> In-Sem. Examination

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

Course Code: RAC1102

Time: 1 Hour

Course Name: Domestic RAC Appliances

Max. Marks: 20

**ANSWER KEY****SET-A****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. Which one is the measuring instrument?

d. Measuring tape

2. Which one is the gauging instrument?

c. Try square

3. Room ACs are based on which cycle?

a. Carnot Cycle

4. Value of 35 micron in Millimeter (mm) is:

d. None of the above

5. By which component, pressure reduction is done in your room AC?

c. Expansion device

**Section – B**

03X02 = 06 Marks

1. Define the term measurement. How measuring is different from gauging.

**Solution:** Measurement is comparing the obtained value with standard set of value.  
Gauging don't give any numerical value like measuring instrument.

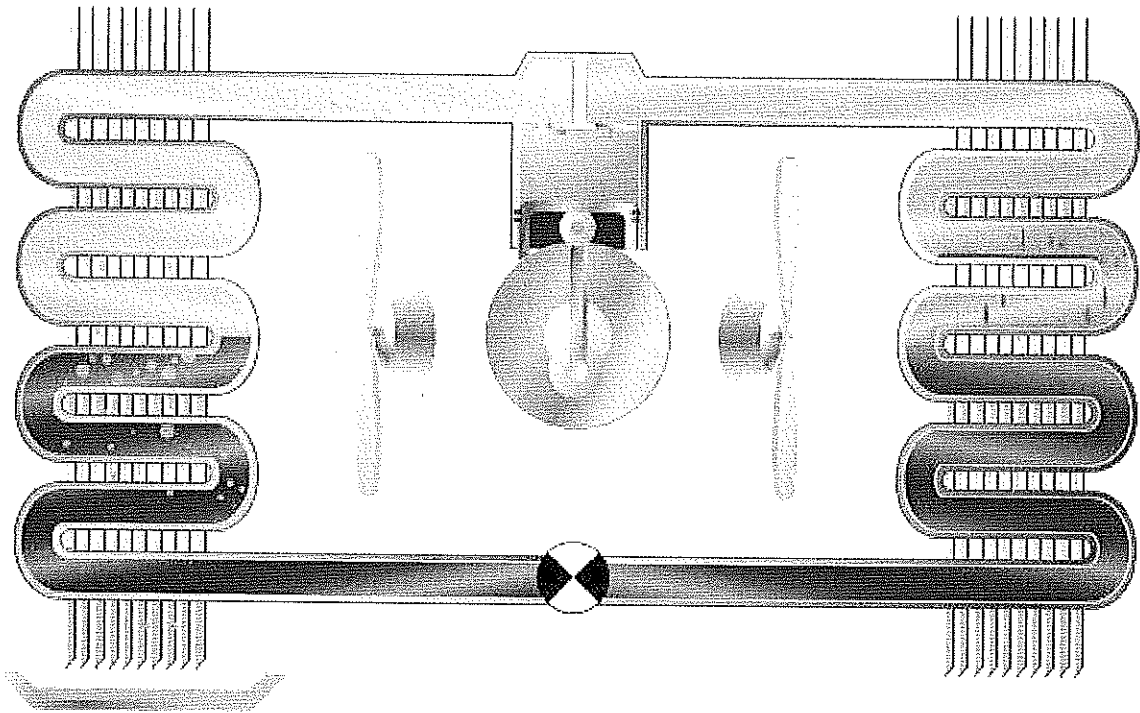
2. You have a Vernier Caliper of least count 0.02 mm. Minimum measurable value on main scale is 1 mm. Find out the total number of divisions on secondary scale.

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Solution: Least count (0.02) =  $1/X$

$X = 50$  Ans.

3. Write down the name of basic components of air conditioner and arrange them in air conditioner cycle.



### Section – C

03X03 = 09 Marks

1. Describe the safety during AC work in detail.

Answer:

#### 1. Personal Safety

Hat

Safety shoes

Gloves

Glasses/Goggles

Ear muff

#### 2. Electrical Safety

Electrical Shock

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Lock out/Tag out

### 3. Mechanical Safety

Rotating and moving parts

Hot/Cold surface

Sharp objects

### 4. Refrigerant/Pressurized Gas Safety

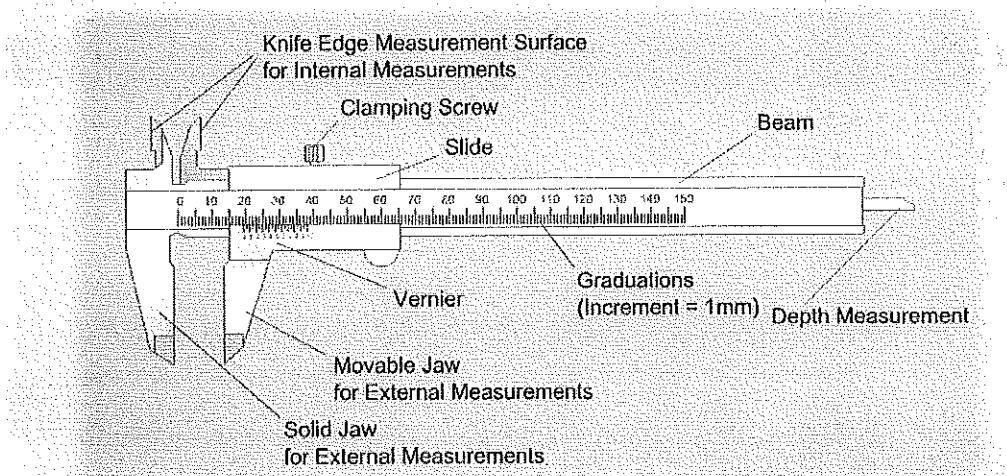
Exposure to refrigerant

Refrigerant container

Refrigerant leakage

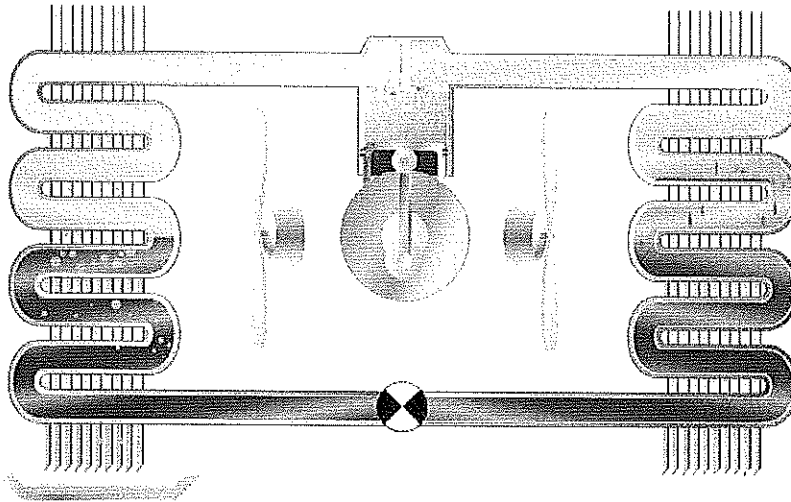
2. Give the name of all the parts of a Vernier Caliper with the help of a neat sketch.

## Calipers Structure IIIII



3. Explain all the processes take place in an air conditioning cycle through a neat sketch cycle.

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<u>Component</u>	<u>Inlet</u>	<u>Outlet</u>
Compressor	Vapour	Vapour
Condenser	Vapour	Liquid
Expansion device	Liquid	Liquid
Evaporator	Liquid	Vapour

*Ahmed  
Bugh*



# BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of RAC Skills

I Semester, 2nd In-Sem. Examination

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

Course Code: RAC1103

Course Name: RAC Electrical, Electronics & Instrumentation-I

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.

Set - A

Section – A

05X01 = 05 Marks

1. Component required in house wiring :

- a. Energy Meter
- b. Voltage
- c. Resistance
- d. Time

2. Fuse is used to protect ?

- a. Voltage
- b. Current
- c. Electrical Appliances
- d. None of the above

3. In single phase how many wires are there

- a. Four
- b. Three
- c. One
- d. Two

4. Distribution box is mainly consists of more electrical parts.

- a. Five
- b. Three
- c. Two



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d. One

5. Live Wire is represented by which colour?

- a. Green
- b. Pink
- c. Blue
- d. Red

### Section – B

03X02 = 06 Marks

1. What is Fuse?
2. Define distribution box.
3. What is a single phase wiring?

### Section – C

03X03 = 09 Marks

1. Components used in the house wiring.
2. Explain safety while doing house wiring.
3. Explain trip switch.

*R Singh*  
*[Signature]*



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School of RAC Skills

I Semester, 1<sup>st</sup> In-Sem. Examination

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

ANSWER KEY

Course Code: RAC1103

Time: 1 Hour

Course Name: RAC Electrical, Electronics & Instrumentation -I Max. Marks: 20

Section – A

05X01 = 05 Marks

1. Components required in house wiring:
  - a. Energy Meter
2. Fuse is used to protect?
  - c. Electrical Appliances
3. In single phase wiring how many wires are there
  - d. Two
4. Distribution box is mainly consists of more electrical parts .
  - b. Three
5. Live wire is represented by which colour?
  - d. Red

Section – B

03X02 = 06 Marks

1. What is fuse?

**ANSWER:** Fuse is used to protect electrical appliances, parts and electronic components from potential damage due to a high current Ampere flowing in the circuit.

2. Define distribution box.



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**ANSWER:** Distribution Box simply distributes the electric supply to sections of the house

3. What is a single phase wiring?

**ANSWER:** Single phase wiring is basically the two wire i.e live and neutral come from the electric pole and then comes to the energy meter and then comes to the RCCB and then distribute to all sections of the house,

Section – C

03X03 = 09 Marks

1. Components used in the house wiring

**Answer :** Components used in the house wiring are :

1. Energy meter
2. Fuse
3. Distribution box:

Main switch, Trip switch and Circuit breakers.

2. Explain safety while doing house wiring

**Answer:** Don't touch someone who's been electrocuted

Always use GFCIs in damp or wet work areas.

Inspect & maintain your electrical tools.

Follow proper lockout/tagout procedures.

Wear the right safety gear.

Choose the right ladder.

3. Explain trip switch

**Answer:** If there is a fault in any of the circuits in the house this switch opens(Trip)automatically and disconnects the power supply.

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School of RAC Skills

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

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

Course Code: RAC1104

Time: 1 Hour

Course Name: Rac Materials and joining process

Max. Marks: 20

Instruction: Attempt all

**Section – A**

05X01 = 05 Marks

Q1. Which among is used for Temporary joining process?

- a. Cotter pin knuckle joint.
- b. Brazing
- c. Bolts and nuts
- d. Option A, C both

Q2. In OXY-FUEL Process which has high pressure\_\_\_\_\_

- a. Butane
- b. Acetylene
- c. Oxygen
- d. Argon

Q3. Acetylene Cylinder Line pressure &amp; cylinder pressure are\_\_\_\_\_

- a. 0.25 bar & 200 bar
- b. 0.5psi & 200 psi
- c. 0.5bar & 200 psi
- d. 0.25Psi &19bar

Q4. Why are flux used?

- a. To prevent the work piece to form oxide (Oxidation)
- b. To Provide filler with clear surface
- c. To prevent the work piece to have Carbon deposition.
- d. All the above option

Q5. Hand shut valve is a NRV to control \_\_\_\_\_

- a) Control flow of gas outside the nozzle
- b) Oxygen in Cutting torch
- c) Reduce the outlet of cylinder.
- d) To ensure proper flow of oxygen



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### Section – B

03X02 = 06 Marks

Q6. Define Brazing & Temperature Range for Brazing?

Q7. What are the safety precautions to be taken in consideration during brazing?

Q8. Difference between Temporary and permanent joints?

### Section – C

03X03 = 09 Marks

Q9. Draw the neat sketch of brazing setup and label each of the component.?

Q10. Calculate the following Area, Perimeter?

a) Triangle with equal sides of 2cm each

b) square with side 10 cm

Q11. What is Refrigerant? Give examples for them?

*Ans*  
*Refrigerant* 

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School of RAC Skills

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

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

Course Code: RAC1104

Time: 1 Hour

Course Name: Rac Materials and joining process

Max. Marks: 20

Instruction: Attempt all

**Section – A**

05X01 = 05 Marks

Q1(d.) Option a &amp; c

A2(c.) Oxygen

A3.d. 0.25Psi &amp;19bar

A4(d.) All the above option

A5(b.) Oxygen in Cutting torch

**Section – B**

03X02 = 06 Marks

A6. Brazing is non detachable joining process most common in AIR-CONDITIONING or pipelines for producing tough, strong and leak proof joint.

Temperature range for brazing is Above 450 Degree and below 1000 Degree

In brazing the base metal is heated and the filler rod is used to deposit the molten metal pool for solidification a A7.

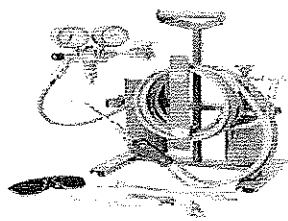
- Use the tools and equipment with care;
- If needed to apply flux, do not use with fingers;
- Nitrogen introduction as protective gas low flow rate inside the pipe assembly during brazing process is good method to avoid oxidation;
- Protect the service valves with wet rags or heat sink material;
- Use only recommended fillers for various joints;
- Never reach temp beyond limits, Keep heating both the tubes, evenly.

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A8.

Temporary Joint	Permanent Joint
Temporary joints allow easy dismantling of assembled components without breaking them.	Permanent joints don't allow dismantling of assembled components without rupturing them.
Temporary joints are not necessarily leak-proof.	Permanent joints are usually leak-proof.
Strength of temporary joint is comparatively less.	Strength of permanent joint is high. Usually joint strength is same with that of the components.
Repair and replacement are also easy.	Repair and replacement are difficult and costly.

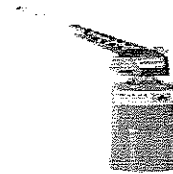
A9.



Brazing tool kit



Brazing Nozzle



Brazing tool kit



Filler Material



Heat Deflector

### Section – C

03X03 = 09 Marks

A10. Calculate the following Area, Perimeter?

a) Triangle with equal sides of 2cm each

$$= \text{Area for equilateral triangle equal to } = \frac{\sqrt{3}}{4} \times (2\text{cm})^2 = 1.73\text{cm square}$$

$$\text{Perimeter} = 3a = 6 \text{ cm}$$

b) square with side 10 cm = 10X10=100Sq. Cm

$$\text{perimeter} = 4X10= 40\text{cm}$$



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A11) A refrigerant is a substance or mixture, usually a fluid, used in a heat pump and refrigeration cycle. In most cycles it undergoes phase transitions from a liquid to a gas and back again. Many working fluids have been used for such purposes. Fluorocarbons, especially chlorofluorocarbons, became commonplace in the 20th century, but they are being phased out because of their ozone depletion effects.

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A

Registration No.: .....

School of RAC Skills  
Session: 2020-21 (Summer Semester)  
B. Voc. Program, 1st Semester,  
2<sup>st</sup> In-Sem. Examination

Course Code: RAC1105

Time: 1 Hour

Course Name: RAC Systems Testing and performance

Max. Marks: 20

**Instruction:**

- (1) Attempt all questions
- (2) In section A, write both option and answer

SET-B

**Section – A**

05X01 = 05 Marks

1. What is the specific heat of water?
  - a. 4.2 KJ/Kg
  - b. 4.2 KJ/Kg C
  - c. 334 KJ/Kg
  - d. 334 KJ/Kg C
2. What equation represents Charles's Law?
  - a.  $P_1 \times V_1/T_1 = P_2 \times V_2/T_2$
  - b.  $V_1/T_1 = V_2/T_2$
  - c.  $P_1 \times V_1 = P_2 \times V_2$
  - d. None of them
3. What is equal to 1 HP?
  - a. 746 W
  - b. 1300 BTU
  - c. 2 HP
  - d. None of the above.
4. What is equal to 1 watt
  - a. 12000 Btu
  - b. 1 HP
  - c. 3.413 Btu's
  - d. None of above
5. Which statement is false
  - a. Warm always moves to cold
  - b. Positive always moves to negative
  - c. Warm air (heat) rises because it is lighter than just air
  - d. None of them

**Section – B**



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03X02 = 06 Marks

6. What is COP?
7. What are power and work, also define relation between them?
8. What is the definition of sensible heat?

## Section – C

03X03 = 09 Marks

9. Write a short note on following
  - i. Perfect gas Law
  - ii. Ton of refrigeration
10. What are different types of expansion devices in VCR system?
11. Write a short note on PH chart.

Long  
Enough  
✓



**School of RAC Skills**  
**Session: 2020-21 (Summer Semester)**  
**B. Voc. Program, 1st Semester,**  
**2<sup>nd</sup> In-Sem. Examination**

**Course Code: RAC1105**

**Time: 1 Hour**

**Course Name: RAC Systems Testing and performance**

**Max. Marks: 20**

**Instruction:**

- (1) Attempt all questions
- (2) In section A, write both option and answer

**SET-B**

**Section – A**

05X01 = 05 Marks

1. What is the specific heat of water?  
b. 4.2 KJ/Kg.C
  
2. What equation represents Charles's Law?  
b.  $V_1/T_1 = V_2/T_2$
  
3. What is equal to 1 HP?  
a. 746 W
  
4. What is equal to 1 watt  
d. none of above
  
5. Which statement is false  
d. None of them

**Section – B**

03X02 = 06 Marks

6. What is COP?

The efficiency of refrigeration systems and heat pumps is denoted by its Coefficient Of Performance (COP). The COP is determined by the ratio between energy usage of the compressor and the amount of useful cooling at the evaporator (for a refrigeration installation) or useful heat extracted from the condenser (for a heat pump). A high COP value represents a high efficiency.

7. What are power and work, also define relation between them?

Word is simply: Force x distance. Force is presented in pounds. Distance is presented in feet.

Example: work is done to move a 100lb object 50 ft: Force x Distance so  $100 \times 50 = 5,000$  ft lbs



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Is the rate at which work is done. Work per unit time is expressed in ft-lbs/min. Rated in Horsepower (HP). Electrical power is measure in watts . 1 HP = 746 Watts

8. What is the definition of sensible Heat?

Heat transfer that results in a change in temperature of a substance. Sensible heat transfers can be measured with a thermometer. Example of a sensible heat transfer: Changing the temperature of a sample of water from 68 to 69 degrees F

## Section – C

03X03 = 09 Marks

9. Write a short note on following

- i. Perfect gas Law
- ii. Ton of refrigeration

i. Perfect gas equation : -

The Ideal gas law is the equation of state of a hypothetical ideal gas. It is a good approximation to the behaviour of many gases under many conditions, although it has several limitations. The ideal gas equation can be written as

$$PV = nRT$$

Where,

P is the pressure of the ideal gas.

V is the volume of the ideal gas.

n is the amount of ideal gas measured in terms of moles.

R is the universal gas constant.

T is the temperature.

According to the Ideal Gas equation-

The product of Pressure & Volume of a gas bears a constant relation with the product of Universal gas constant and the temperature.

i.e.  $pV=nRT$

- i. It takes 144 BTU to melt one pound of ice at 32 degrees Fahrenheit  
2,000 pounds (1 ton) of ice will require 288,000 Btu to melt – Formula here is  
 $144 \times 2000 \text{ lbs} = 288,000 \text{ btu}/24 \text{ hours}$

10. What are different types of expansion devices in VCR system?

a. Thermal Expansion Valves: -

A thermal expansion valve or thermostatic expansion valve (often abbreviated as TEV, TXV, or TX valve) is a device that controls the amount of



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refrigerant released into the evaporator and is intended to regulate the superheat of the vapor leaving the evaporator.

- a. **Capillary Tubes:** -A capillary tube is a long, wound up copper tube with a tiny opening that receives hot, high-pressure liquid refrigerant from the condenser. This small opening holds high pressure on one side of the tube and low pressure on the opposite side. The friction from the walls of the tube rapidly reduces the pressure of the refrigerant flowing through it.
- b. **Automatic Valves:** - These types of expansion valves consist of a needle with a seat and a pressure bellows or diaphragm with a torsion spring capable of adjustment. Operated by evaporator pressure their chief disadvantage is their relatively poor efficiency compared with other types.

11. Write a short note on PH chart.

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 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 reason liquid and vapour both present according to the temperature and pressure.



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