BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of RAC Skills

Session: 2021-22 (Summer Semester)

B. Voc. 5th Semester

1st In- Sem. Examination

Course Code: HVA1501 **Time: 1 Hours**

Course Name: Heat Load Estimation **Max. Marks: 20**

Instruction: Attempt all questions

Section – A

05X01 = 05 Marks

1. Purchasing high efficiency appliances will:-

   a) Increase the Load b) Decrease the Load c) Not effect the Load d) None of the above

2. As long as there is temperature difference, the heat will travel from:-
   a) Cooler to warmer source
   b) Warmer to cooler source
   c) Will not travel at all
   d) None of the above

3. Which of the following does not separate interior and exterior of a building –
   a) Floor
   b) Walls
   c) Electrical Boxes
   d) Roof

4. Which of the following is not a requirement for a barrier:
   a) Durability
   b) Strength
   c) Rigidity
   d) Vents

5. Which of the following is not a building envelope problem:
   a) Spalling
   b) Cracking
   c) Insulation
   d)Effloroscence

Section – B

03X02 = 06 Marks

1. Why is zoning done in a building?
2. What are the sources of internal heat gain in a room?
3. What is a building envelope?

Section – C

03X03 = 09 Marks

1. What are transmission gains and its sources?
2. What is stack effect?
3. How is heat load calculated using a Heat transfer multiplier?

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Answer key

Instruction: Attempt all questions

Section – A

05X01 = 05 Marks

1. b
2. b
3. c
4. d
5. c

Section – B

03X02 = 06 Marks

1. Zoning is done in building to determine the spaces which spaces are to be conditioned so that a proper selection of equipment and proper design of ducting can be achieved by it.

2. The internal gain sources are Humans, Lighting equipment and the appliances which are being used inside the room or building.

3. The building envelope is the exterior or shell of a building that repels the elements. ... It is the physical separator between the conditioned and unconditioned environment of a building including the resistance to air, water, heat, light, and noise transfer.

Section – C

03X03 = 09 Marks

1. **Transmission losses is the process of materials in the house having an effect on the heat gain and heat loss. The source of transmission losses are:**

- Type of material
- Thickness and thermal conductivity
- Area of the material
- Temperature difference between indoors and outdoors

Type of material

- Societies have developed charts for transmission losses through the type of material that may be found in homes and commercial buildings. A designer or technician will use these charts to understand the difference between similar products and how it can affect the heat load of a building.

Thickness and thermal conductivity

- Once the HVAC designer has determine the type of material that will be used in the home, they will determine the square footage used and how thick material. The amount of material would transfer pre-determine amount of heat through it. By adding greater amount of insulation in an attic can reduce the heat transfer through the ceilings.

2. Hot air rises through the building and escapes through cracks in the top ceiling. This causes cold outside air to be drawn in low (around the sole plate, basement windows or crawlspace access). While some outside air is necessary for fired equipment that is usually located in the basement (dryer, water heater, furnace, etc.), it is better to provide this air directly to the mechanical room. This helps to reduce drafts in the building caused by these devices. This stack effect becomes very pronounced in high-rise buildings, often causing noisy elevator and stair doors, where air is drawn into (or out of) these vertical shafts.

3. **Formulas for Heat Loss**

- Basic Heat Transfer Q = HTM x A x ΔT
- Q = Quantity of Heat Energy
- HTM = Heat Transfer Multiplier
- A = Area
- ΔT = Temperature Difference
    - The heat transfer multiplier is the rating of the material of how it will resist heat transfer through it per square foot.

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BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of RAC Skills

V Semester, 1st In-Sem. Examination

B. Voc. Program, Summer Semester (2021-22)

Course Code: HVA1502 Time: 1 Hour

Course Name: Cold Chain & Cold Storage 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. Keeping in mind that texture changes take place after harvest, pulpy fruits become extremely hard after harvest.

a. True
b. False
c. Mixed
d. None of the above

2 After harvest, _____ of fruits and vegetables undergoes change.

a. Texture, nutrients, minerals
b. Color, minerals, nutrients
c. Texture, minerals, nutrients
d. None of the mentioned

3 Which of the following is true about fruits and vegetable processing?

a. They get spoil very fast and hence need to be consumed soon
b. They have high moisture content and should be kept in a cold, dark place
c. They're tender and hence get spoiled easily
d. All of the mentioned

4 Which of the following is not related to Post Harvest losses?

a. Postharvest losses can be reduced by adding value to products
b. Packaging, storage, transportation areas are where losses take place
c. Farmers don't earn much after adding value to products
d. Value can be added to products by converting raw form into a more processed/refined form

5. Which of the following are Milk Processing Operations?

a. Clarification
b. Pasteurization
c. Homogenization
d. All of the mentioned

Section – B

03X02 = 06 Marks

1. What is the difference between cold storage and cold chain?
2. Write a short note on cold store doors.
3. Write down the different types of cold storages.

Section – C

03X03 = 09 Marks

1. Explain post harvest physiology of fruits and vegetables through neat sketch.
2. Write down the pre harvesting factors that affect the product quality.
3. Explain different types of insulation in detail.

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of RAC Skills

III Semester, 1st In-Sem. Examination

B. Voc. Program, Summer Semester (2021-22)

ANSWER KEY

Course Code: RAC1304 Time: 1 Hour

Course Name: Cold Chain & Cold Storage Max. Marks: 20

Section – A

05X01 = 05 Marks

1. Keeping in mind that texture changes take place after harvest, pulpy fruits become extremely hard after harvest.

b. False

2 After harvest, _____ of fruits and vegetables undergoes change.

a. Texture, nutrients, minerals

3 Which of the following is true about fruits and vegetable processing?

d. All of the mentioned

4 Which of the following is not related to Post Harvest losses?

c. Farmers don't earn much after adding value to products

5. Which of the following are Milk Processing Operations?

d. All of the mentioned

Section – B

03X02 = 06 Marks

1. What is the difference between cold storage and cold chain?

A cold chain warehouse (or cold chain storage) is a specialized structure that's always closed off and insulated from its external environment, and where conditions inside are carefully controlled. Cold chain warehouses (often referred to as ""cold storage"" or ""temperature controlled warehouses"") are used to store perishables that are extremely sensitive and can spoil easily if not stored properly. Transportation in cold chains is carried out in cold boxes or refrigerated containers that accomplish EXACTLY what a cold chain warehouse's facilities do - guarantee that temperature-sensitive goods are maintained in conditions that guarantee their survival, whether in the warehouse or on the road.

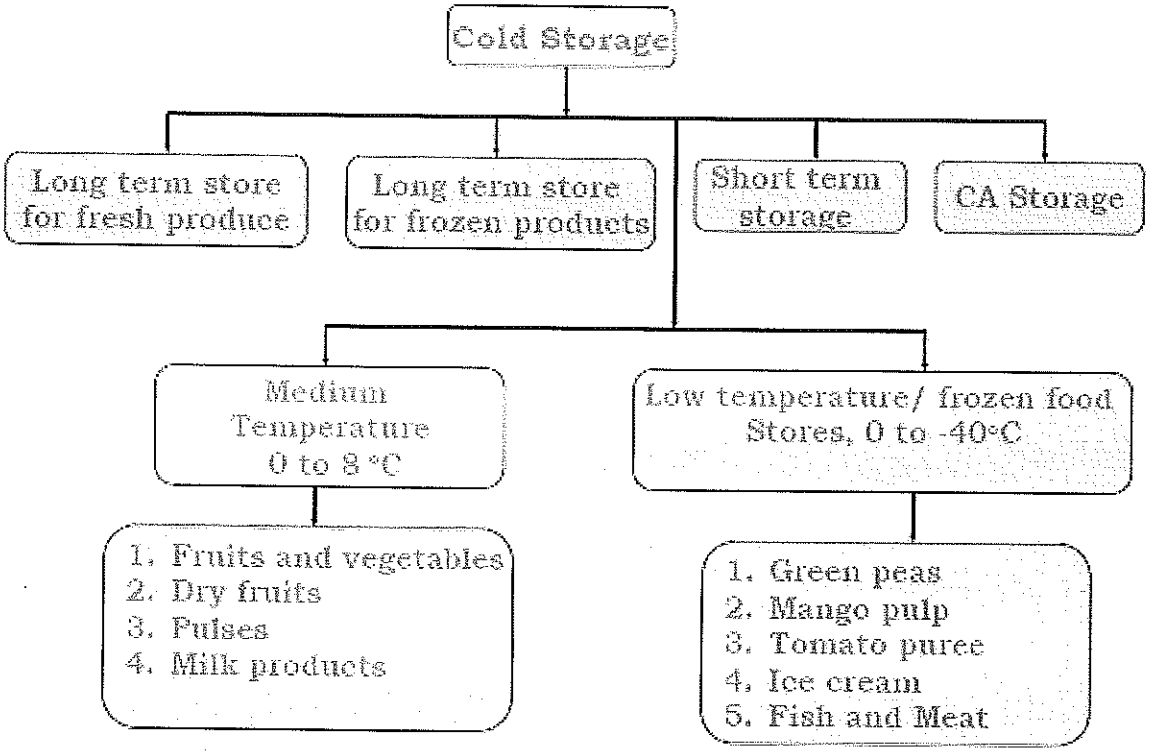
A cool store or cold store is a large refrigerated room or building designed for storage of goods in an environment below the outdoor temperature. Products needing refrigeration include fruit, vegetables, seafood and meat. Cold stores are often located near shipping ports used for import/export of produce.

2. Write a short note on cold store doors.

When choosing a door system the following should be considered

- Is the track designed to give a good positive sealing action without undue wear to the sealing gaskets and will it be strong enough for its usage?
- Does it allow the door to be adjusted easily and accurately in all directions?
- Are the runners durable and will they allow free running?
- Will the handles, both inside and outside, allow easy opening of the door?
- Can the system be locked and does it have an emergency release facility?
- Do the moving parts require little maintenance and can they be easily replaced in the event of damage?

3. Write down the different types of cold storages.



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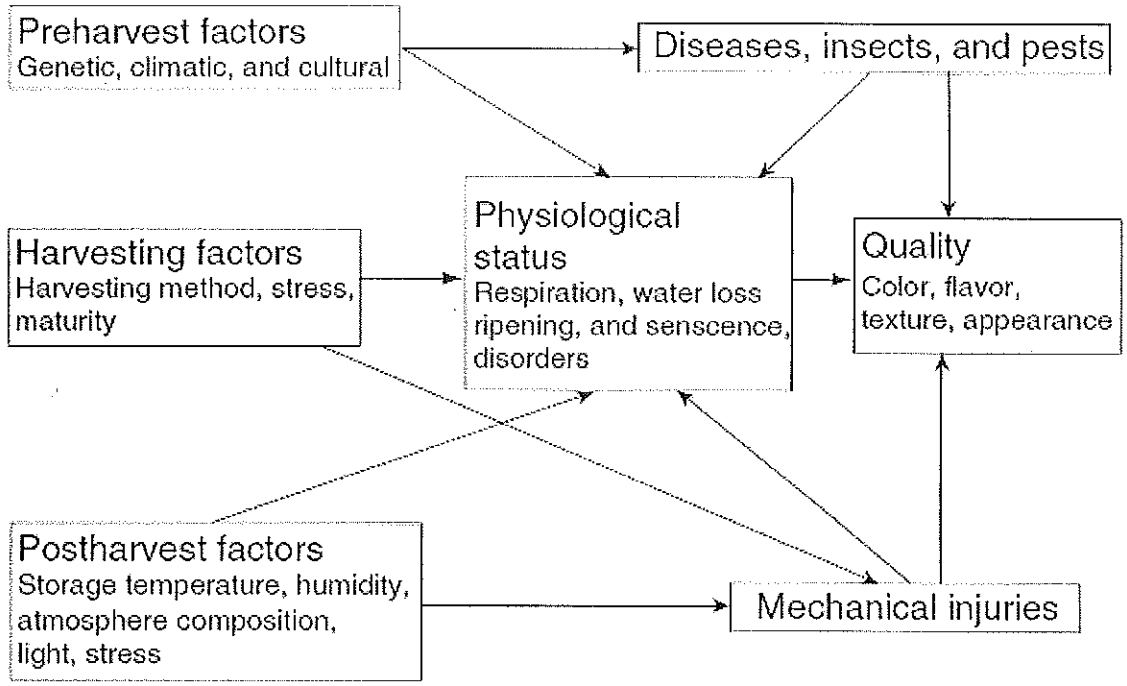
BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Section – C

03X03 = 09 Marks

1. Explain postharvest physiology of fruits and vegetables through neat sketch.



2. Write down the pre harvesting factors that affect the product quality.

Answer: Genetic

Genetic makeup has a profound effect on the selection of a raw material for a given processing application. Cultivar and rootstock selection influence the composition, quality, storage potential, and response to processing characteristics that may be inherited.

Climatic

The growing region and environmental conditions specific to each region, such as temperature, humidity, light, wind, soil texture, elevation, and rainfall, significantly influence the quality of fruits and vegetables.

Cultural Practices

Soil type, soil nutrient and water supply, pruning, thinning, pest control or chemical spray, and density of planting influence the quality of plant produce.

3. Explain different types of insulation in detail.

Expanded polystyrene

Expanded polystyrene (EPS) is one of the most efficient rigid insulation materials available today and is widely and successfully used throughout the cold store industry.

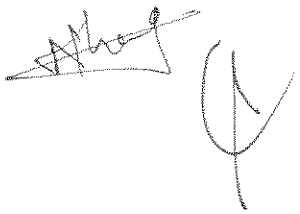
Extruded polystyrene

Extruded polystyrene is basically manufactured from the same raw material as EPS, with the exception that extruded polystyrene for use in panel production is a foam insulation board without a skin. Other forms of extruded polystyrene are available, incorporating a skin, such as the heavier density used for floor insulation purposes. It is manufactured by a continuous

extruding process which gives a rigid closed cell structure with unique properties.

Polyurethane

Rigid polyurethane (PUR) foams are highly cross-linked polymers with closed cell structures which bubble within the material, with unbroken walls, so that gas movement is retarded. The chlorofluoromethane gas is contained within the walls and, as these substances have a much lower thermal conductivity than air, such closed cell forms have significantly lower thermal conductivity than any open cell foam.



BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Refrigeration and Air-conditioning Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, V Semester,

1st In-Sem. Examination

Course Code: HVA1503 **Time: 1 Hour**

Course Name: Chilled water supply system design **Max. Marks: 20**

Section – A

05*01 = 05 Marks

Note: Each question carries 02 mark.

Q. 1: When a chiller is used, the secondary refrigerant that circulates in the building is

A. Air
B. water
C. brine
D. glycol

Q. 2: A refrigerant compressor is used to

A. raise the pressure of the refrigerant
B. raise the temperature of refrigerant
C. circulate the refrigerant through the system
D. all of the above

Q. 3: The natural convection air-cooled condensers are used in

A. domestic refrigerators
B. water coolers
C. room air conditioners
D. all of these

Q. 4: VCRC cycle does not have.

A. Compressor
B. Condenser
C. Generator
D. Evaporator

Q. 5: The commonly used refrigerant in ice plant is

A. NH_3
B. CO_2
C. R-12
D. none of these

Section – B

03*02 = 06 Marks

Note: Each question carries 02 mark.

Q. 1: Classified the refrigerants with examples.

Q. 2: Classified the HVAC chiller.

Q. 3: What is the difference between a single-stage and two-stage centrifugal compressor?

Section – C

03*03 = 09 Marks

Note: Each question carries 03 mark.

Q. 1: Explain the three loops of water-cooled HVAC system with neat sketch.

Q. 2: Write down the advantages and disadvantages of vapour absorption refrigeration system over vapour compression refrigeration system.

Q. 3: Write down the advantages of water cooled and air-cooled condenser chiller system.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Refrigeration and Air-conditioning Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, V Semester,

1st In-Sem. Examination

Answer key

Course Code: HVA1503 **Time: 1 Hour**

Course Name: Chilled water supply system design **Max. Marks: 20**

Section – A

05*01 = 05 Marks

05 objective type questions, each question carries 01 mark.

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

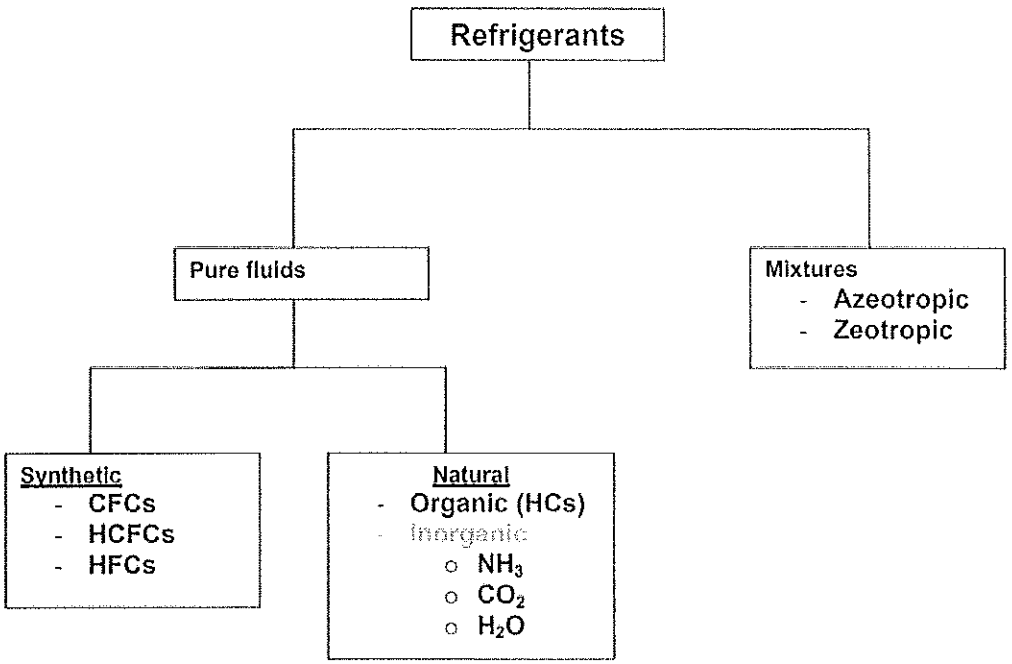
Section – B

03*02 = 06 Marks

3 short answer type questions, each question carries 02 marks.

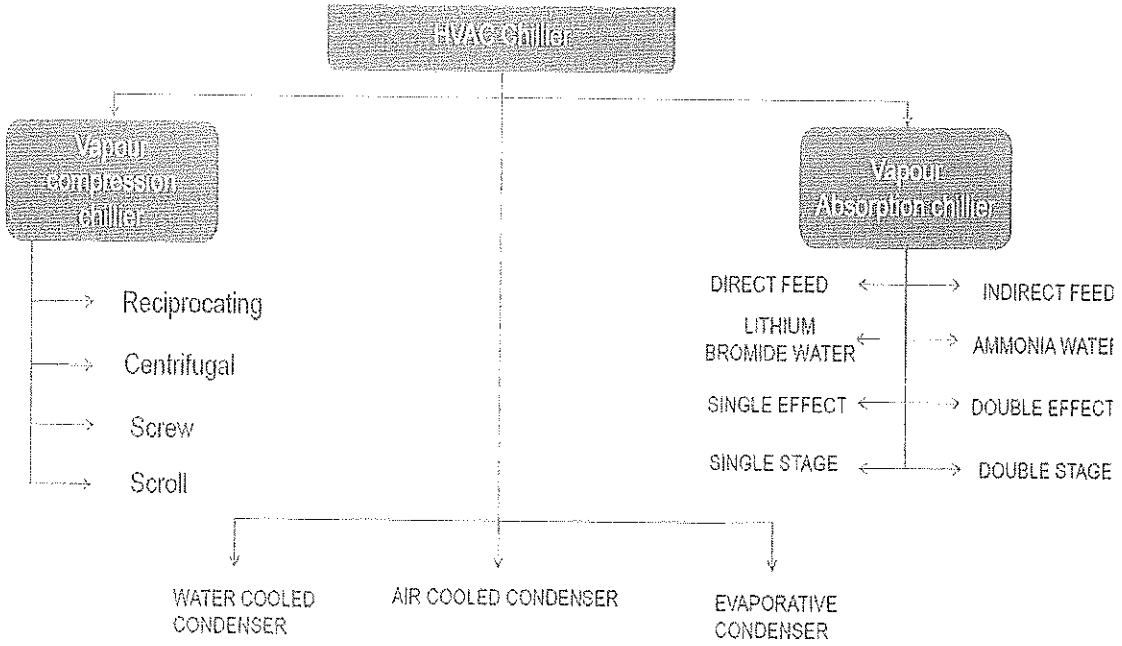
Q. 1: Classified the refrigerants with examples.

Ans.



Q. 2: Classified the HVAC chiller.

Ans.



Q. 3: What is the difference between a single-stage and two-stage centrifugal compressor?

Ans. The main difference between single- and two-stage compressors is the number of times that air gets compressed between the inlet valve and the tool nozzle. In a single-stage compressor, the air is compressed one time; in a two-stage compressor, the air is compressed twice for double the pressure. Two-stage compressors perform less work to compress air to a given pressure, which means operating costs are lower and efficiency gets improved.

Section – C

03*03 = 09 Marks

03 essay type questions, each question carries 03 marks.

Q. 1: Explain the three loops of water-cooled HVAC system with neat sketch.

Ans.

- Loop 1: Air system: Cold air is distributed by one or more air-handling units (AHUs) to the spaces within the building. The distributed air is returned to the air handling unit, mixed with the required quantity of outdoor air for ventilation.
- Loop 2: Chilled water system: The warmer-returned chilled water enters the water chiller where it is cooled to the desired chilled water supply temperature by transferring the heat extracted from the building spaces to a primary refrigerant.
- Loop 3: Condenser water system: The heat of compression must then be added to the heat load on the chilled water loop to establish the amount of heat that must be rejected by the condenser to a heat sink, typically the outdoor air.

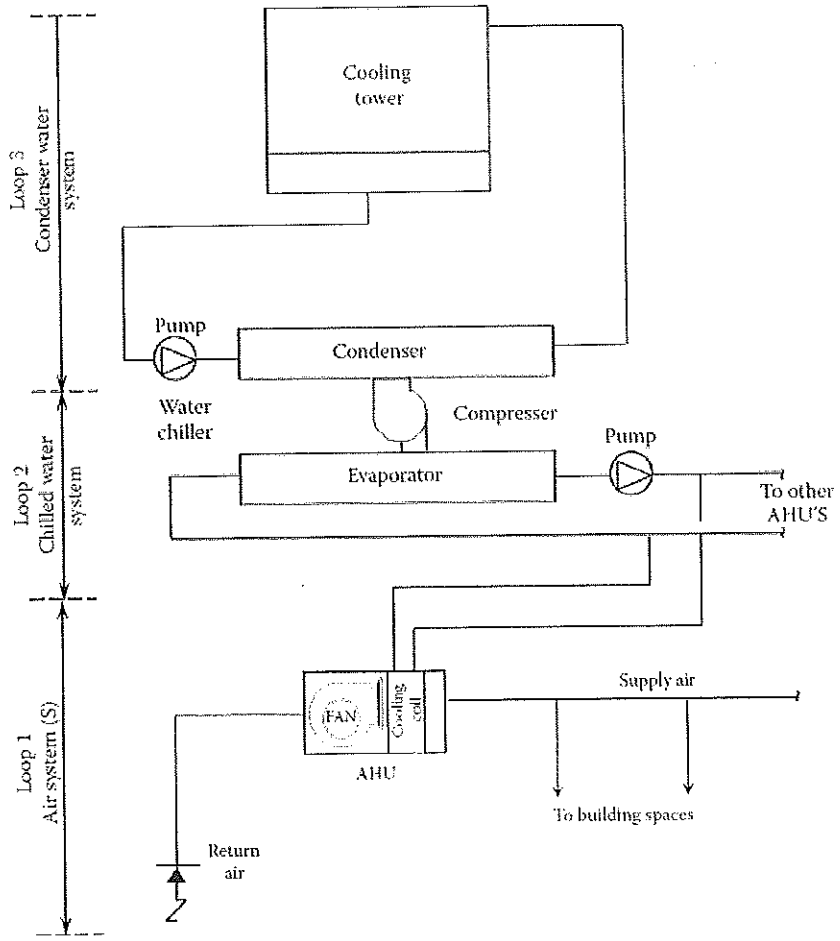


Fig. Water-cooled HVAC system

Q. 2: Write down the advantages and disadvantages of vapour absorption refrigeration system over vapour compression refrigeration system.

Ans.

Advantages of VARS over VCRC

1. In the VARS, the only moving part of the entire system is a pump which has a small motor. Thus, the operation of this system is essentially quiet and is subjected to little wear. The vapour compression system of the same capacity has more wear, tear and noise due to moving parts of the compressor.
2. VARS system uses heat energy to change the condition of refrigerant from the evaporator. The VCRC system uses mechanical energy to change the condition of refrigerant from the refrigerant.
3. The VARS system are usually designed to use steam, either at high pressure or low pressure. The exhaust heat from furnaces and solar energy may also be used. Thus,

this system can be used where the electric power is difficult to obtain or is very expensive.

4. The space requirements and automatic control requirements favor the absorption system more and more as the desired evaporator pressure drops.
5. The VARS system can be built in capacities well above 1000 tons of refrigeration each, which is the largest size for single compressor units.
6. The load variations do not affect the performance of VARS system. The performance of a vapour compression system at partial loads is poor.
7. In the VARS system, the liquid refrigerant leaving the evaporator has no bad effect on the system except that of reducing the refrigerating effect. In the VCRC system, it is essential to superheat the vapour refrigerant leaving the evaporator so that no liquid may enter the compressor.

Disadvantage:

1. Less COP
2. More space required
3. More amount of refrigerant is circulated, which increase the running cost.

Q. 3: Write down the advantages of water cooled and air-cooled condenser chiller system.

Ans.

S. No.	Water cooled chiller	Air-cooled chiller
1	Higher efficiency	Lower installed cost
2	Custom selections on larger sizes	Quicker availability
3	Larger tonnage capabilities	No cooling tower or condenser pump required
4	Indoor chiller location	Less maintenance
5	Longer life	No mechanical room required

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Registration No.: .....

School of Refrigeration & Air conditioning Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, V-Semester,

1st In-Sem. Examination

Course Code: HVA1504 **Time: 1 Hour**

Course Name: AC system & Testing **Max. Marks: 20**

Instruction:

1.Read the question carefully, do attempt all

Section – A

05X01 = 05 Marks

Q1) What is Nacph _____?
a. Number of air change per hour b. Number of air condensed per hour
c. Number of person cfm per hour d. Number of air cumulated per hour

Q2) What G.I in a metal sheet means?
a. Gram squared milli meter b. Galvanized Iron
c. Grinded edge sheet d. Gram squared moles

Q3) NBC Stands for
a. National boiler codes b. National BIM Codes
c. National bureau of standard d. National building codes

Q4) BIS-277 is for _____
a. Sheet Metal Specification (GI) b.BIS-655 Sheet Metal Fabrication and Erection Installation (GI).
c. Sheet Metal Work Safety Standards. d. Duct Work

Q5) What is GSM in sheet metal working for duct?
a. Gram squared milli meter b. Gram squared meter
c. Gram squared metric d. Gram squared moles

Section – B

03X02 = 06 Marks

Q6) How ducts are classified according to pressure?
Q7) What is ventilation explain?
Q8) Draw a labelled diagram for Air scrubber

Section – C

03X03 = 09 Marks

Q1) Types of ventilation used along with application ?

Q2) Classify the duct based on

1)Shapes

2) Velocity with range

Q3) In a central Chiller plant Draw and explain the component with cycle?

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Course Code: HVA1504 **Time: 1 Hour**

Course Name: AC system & Testing **Max. Marks: 20**

Instruction:

1.Read the question carefully, do attempt all

Answer key

Section – A

05X01 = 05 Marks

A1) a. Number of air change per hour
A2) b. Galvanized Iron
A3) d. National building codes
A4) a. Sheet Metal Specification (GI)
A5) b. Gram squared meter

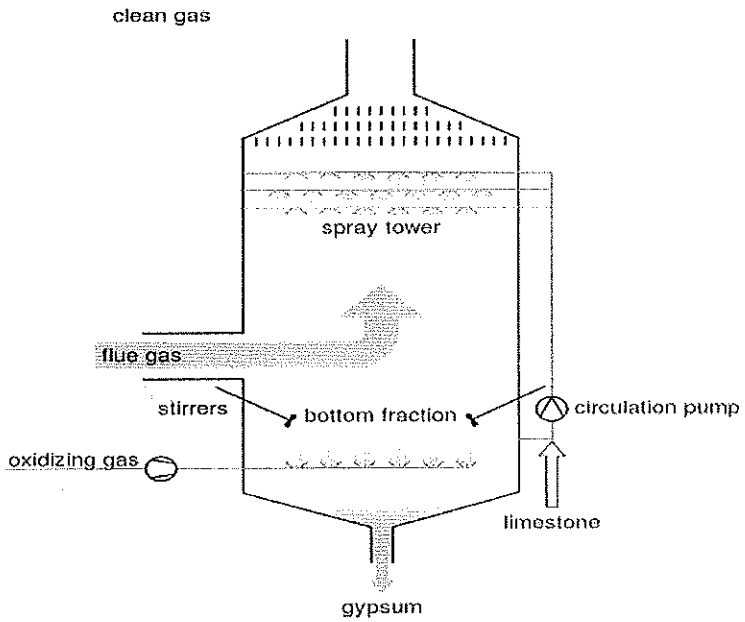
Section – B

03X02 = 06 Marks

A6. According to pressure

SMACNA –Sheet Metal Air-Conditioning Contractor National Association
Class 1-3 ¼ water column ,
class2-Friction values up to 3 ¼-6 ½ in W.C ,
Class3-6 ½- 12 ¼ w.c
Inch W.C= 249 pascal

A7. Ventilation is the Exchange of Room air with Fresh air. • Sending Foul air out from the room/space and supplying fresh air into the room/space. • Ventilation is a vital requirement for the comfort and health of building occupants



A8.

Section – C

03X03 = 09 Marks

Q9) Types of ventilation used along with application?

A 9. Natural

1) single – side ventilation 2) cross flow ventilation 3) stack ventilation 4) Top - down ventilation

Artificial Forced

1) positive pressure 2) Horizontal Mechanical 3) Hydraulic

A10) Classify the duct based on

1)Shapes-ROUND SQUARE RECTANGLE, FLAT OVAL

2) Velocity with range According to Duct velocity

1. Low – up to 1500 FPM
2. Medium -1500-2500 FPM
3. High-2500-4500 FPM

A11)