BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Refrigeration and Air-conditioning Skills

Session: 2021-22 (Winter Semester)

B. Voc. Program, V Semester,

1st In-Sem. Examination

Course Code: HVA1501 **Time: 1 Hour**

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

Section – A

05*01 = 05 Marks

Note: Each question carries 01 mark.

Q. 1: A human being gives off_____ BTUs

A. 200 B. 300
C. 100 D. 500

Q. 2: HTM stands for

A. Heat transfer multiplier B. Heat termination multiplier
C. Heat transfer multitude D. None of the above

Q. 3: Which of the following is not a part of building envelope

A. Walls B. Floor
C. Foundation D. None of the above

Q. 4: Which of the following is not an envelope problem?

A. Cracking B. Collapse
C. Rigidity D. Spalling

Q. 5: Which of the following is not an internal gain?

A. People B. Lighting fixtures
C. Infiltration D. Appliances

Section – B

03*02 = 06 Marks

Note: Each question carries 02 mark.

Q. 1: What are different heat gain variables?

Q. 2: Explain transmission gains

Q. 3: What is the method to find Heat gain in a building?

Section – C

03*03 = 09 Marks

Note: Each question carries 03 mark.

Q. 1: What is building envelope? What are its impacts?

Q. 2: What are the requirements of a building envelope?

Q. 3: What are the problems that can occur in a building?

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Course Code: HVA1501 **Time: 1 Hour**

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

Section – A

05*01 = 05 Marks

05 objective type questions, each question carries 01 mark.

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

Section – B

03*02 = 06 Marks

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

1. Flows of heat
   Air leakages
   Moisture
   Solar Gain
   Building Orientation
   Regional effects
   Relative humidity

2. 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

3. 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.

Section – C

03*03 = 09 Marks

03 essay type questions, each question carries 03 marks.

1. The building envelope is the enclosure, barrier, and separator of the outdoor environment and the desired indoor environment. It is also the protector from the undesired outdoor threats of danger.

   Barrier between conditioned inside air and unconditioned outside air

   Significant impact on passive heat lost and gained by the building

   Passive heat transfer increases the load on the HVAC system

2. Durability
   Strength
   Rigidity

   Control of heat flow (insulation)
   Control of air flow (air barrier)
   Control of vapor flow (vapor)
   Control of rain penetration

3. Spalling
   Cracking
   Rain penetration
   Moisture problems

   Efflorescence
   Deficient thermal resistance
   High energy cost
   Collapse

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BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of RAC Skills

V Semester, 1st In-Sem. Examination

B. Voc. Program, Winter 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. Define the term food & food preservation.
2. Write down the importance of food preservation.
3. Write a short note on raking system.

Section – C

03X03 = 09 Marks

1. Explain the food preservation methods.
2. Write down the pre harvesting factors that affect the product quality.
3. Write down Pushback racking

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BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of RAC Skills

V Semester, 1st In-Sem. Examination

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

Course Code: HVA1502 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. Define the term food & food preservation.

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 down the importance of food preservation.

   The main reasons for food preservation are to overcome inappropriate planning in agriculture, produce value-added products, and provide variation in diet. The agricultural industry produces raw food materials in different sectors. Inadequate management or improper planning in agricultural production can be overcome by avoiding inappropriate areas, times, and amounts of raw food materials as well as by increasing storage life using simple methods of preservation. Value-added food products can give better-quality foods in terms of improved nutritional, functional, convenience, and sensory properties. Consumer demand for healthier and more convenient foods also affects the way food is preserved. Eating should be pleasurable to the consumer, and not boring. particularly in underdeveloped countries to reduce reliance on a specific type of grain (i.e., rice or wheat).

3. Write a short note on raking system.

   wide-aisle static adjustable pallet racking (APR): counter-balance truck operation

   narrow-aisle adjustable pallet racking (NAPR): reach truck operation

   very-narrow-aisle adjustable pallet racking (VNAPR): turret truck operation.

   drive-in/drive-through pallet racking

Section – C

03X03 = 09 Marks

1. Explain the food preservation methods.

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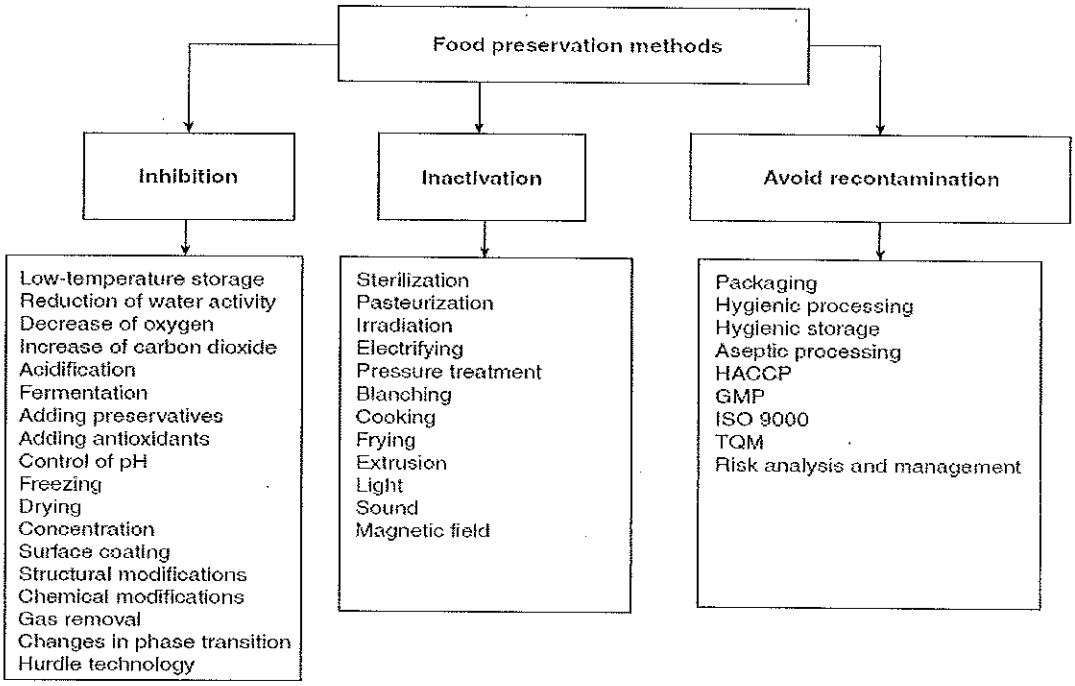

2. Write down the pre harvesting factors that affect the product quality.

   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. Write down Pushback racking

   Last in, first out (LIFO): These are relatively new systems on the market that have the same basic structure as the live storage system. Pallets are placed either on rollers, guides, chains or platens and pushed away from the input face by the next pallet. There are two basic systems: gravity roll forward (up to four deep) and mechanically brought forward (up to 12 deep). Because the pushing force is provided by the handling equipment, there is a limitation on the depth of the system. If a reach truck is used it will probably be limited to three or four levels and no more than four deep. A counterbalance truck is likely to have the increased stability to work a mechanically brought-forward system. Cost indications, building heights and handling equipment are the same as the FIFO system. However, there is a floor-space saving as a common access gangway serves for both input and output operations.

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School of Refrigeration and Air-conditioning Skills

Session: 2021-22 (Winter 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 01 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: What are some refrigerants used in chillers.

Q. 2: Classify the HVAC chiller.

Q. 3: What is the difference between a chiller and VRF?

Section – C

03*03 = 09 Marks

Note: Each question carries 03 mark.

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

Q. 2: Explain vapor absorption system with a diagram

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

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Session: 2021-22 (Winter 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

05 objective type questions, each question carries 01 mark.

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

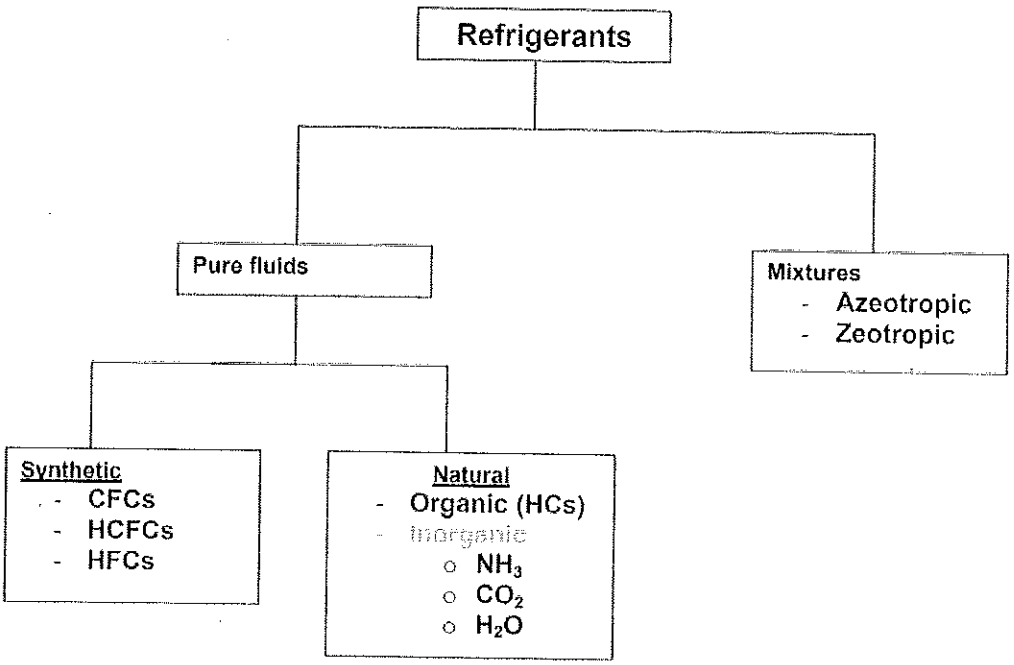
Section – B

03*02 = 06 Marks

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

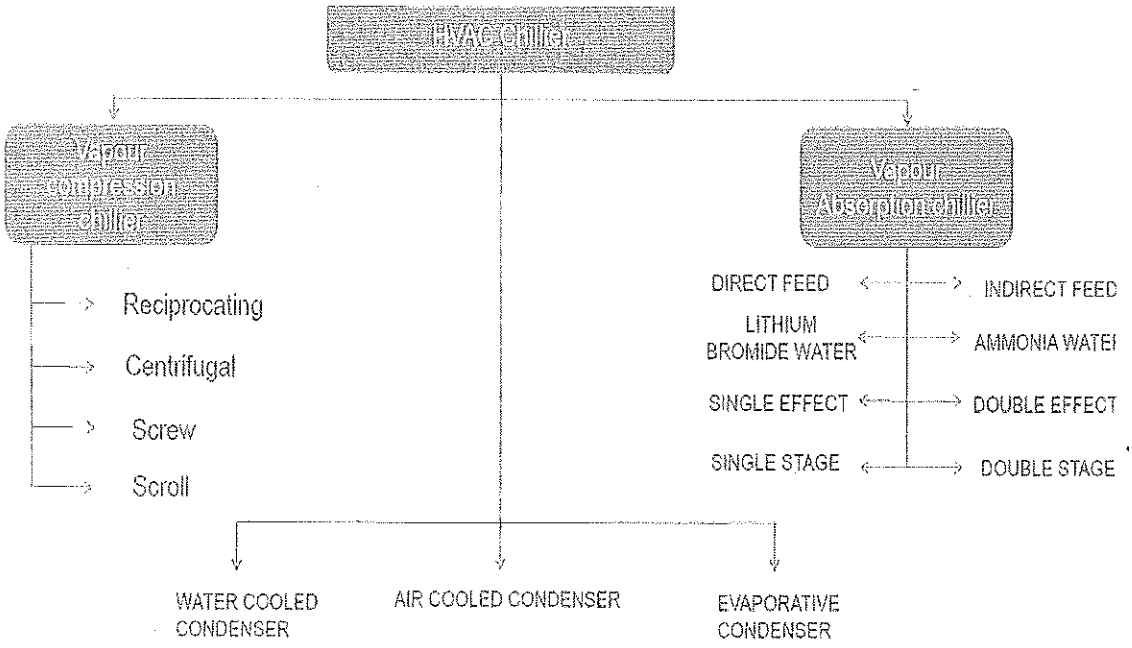
1:

Ans.



2: Classified the HVAC chiller.

Ans.



3

Ans. The main difference between chiller and VRF is the number of times that air gets compressed between the inlet valve and the tool nozzle. In a chiller there is indirect expansion cycle where the primary cycle has refrigerant and which further cools the secondary refrigerant that is water. But in VRF there in only primary cycle with expansion valves for every single indoor unit.

Section – C

03*03 = 09 Marks

03 essay type questions, each question carries 03 marks.

Ans.1

- 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.

Ans2.

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.

Ans3.

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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School of Refrigeration & Air conditioning Skills

Session: 2021-22 (Winter Semester)

B. Voc. Program, V-Semester,

1st In-Sem. Examination

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

Course Name: AC system and testing **Max. Marks: 20**

Instruction: Read the question carefully, do attempt all

Section – A

05*01 = 05 Marks

Q1) What G.I. in a metal sheet means?
a. Gram squared milli meter
b. Galvanized iron
c. Grinded edge sheet
d. Gram squared moles

Q2) 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

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

Q4) BIS – 277 stands for _____ .
a. Sheet metal specification
b. sheet metal fabrication and erection
c. work safety standard
d. Duct work

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

Section – B

03*02 = 06 Marks

Q1) How ducts are classified according to pressure?
Q2) What is ventilation. explain?
Q3) Draw and explain the water cooled VCRC cycle.

Section – C

03*03 = 09 Marks

Q1) Write types of ventilation used along with application?
Q2) Classify the duct based on shapes and velocity with range
Q3) Draw a labelled diagram for Air scrubber

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B. Voc. Program, V-Semester,

1st In-Sem. Examination

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

Course Name: AC system and testing **Max. Marks: 20**

Answer key

Section – A

05*01 = 05 Marks

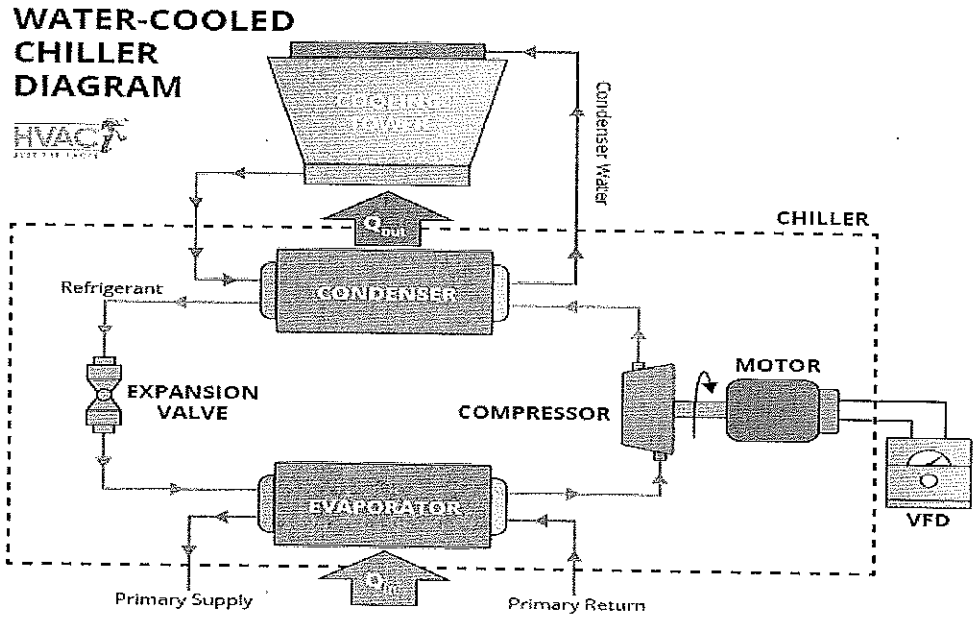
A1) b
A2) a
A3) d
A4) a
A5) a

Section – B

03*02 = 06 Marks

A 1. Duct classification for various pressure range was given by SMACNA (sheet metal air-conditioning contractor national association)
Class 1 – up to 3 ¼ column
Class 2 –3 ¼ - 6 ½ column
Class 3 –6 ½ - 12 ¼ column

A2.
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.
A3)



Section – C 03*03 = 09 Marks

Q1) Write types of ventilation used along with application??

A 1. 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

A2) Classify the duct based on

1)Shapes - round, square, rectangle, flat and 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

A3. Air scrubber