BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of RAC Skills

Session: 2020-21 (Winter Semester)

B. Voc. 5th Semester

2nd -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. Which of the following is not required for a good vapor barrier?
   a) Durability b) Strength c) Circulation d) Rigidity

2. Which of the following is not a part of building envelope –
   a) Floor
   b) Walls
   c) Electrical Boxes
   d) Roof

3. R value of a material is inversely proportional to:-
   a) Solar Gain factor
   b) U-factor
   c) Radiant heat factor
   d) Convection factor

4. Stacking is caused by:
   a) Exfiltration
   b) Infiltration
   c) Pressure difference
   d) All of the above

5. Which of the following Law's determine intensity
   a) Planck's Law
   b) Charles Law
   c) Boyle's Law
   d) none of the above

Section – B

02X03 = 06 Marks

1. What are impacts of building envelope?
2. What is Infiltration gain?
3. What is view factor?

Section – C

03X03 = 09 Marks

1. What is wind and stack effects? Explain.
2. What are the properties of radiation?
3. What happens if the building envelope is inadequate?

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of RAC Skills

Session: 2020-21 (Winter Semester)

B. Voc. 5th Semester

2nd -Sem. Examination

Course Code: HVA1501 **Time: 2 Hours**

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

Instruction: Attempt all questions

Section – A

05X01 = 05 Marks

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

Answer key

Section – B

02X03 = 06 Marks

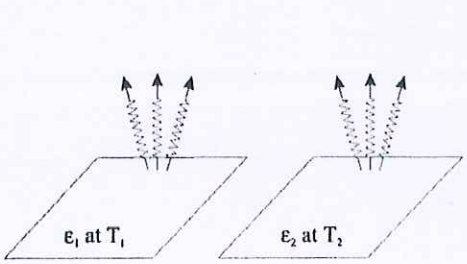
1. Barrier between conditioned inside air and unconditioned outside air

- Significant impact on passive heat lost and gained by the building
- Passive heat transfer increases the load on the HVAC system

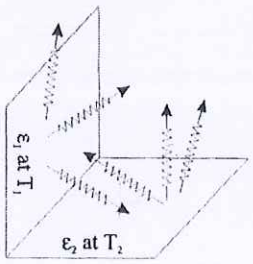
2. Infiltration is the process of air coming into the house from the outdoors. There are many factors that can cause infiltration such as windy days, a large temperature difference from indoors and out, and the stack effect. There are two main forces driving infiltration: the prevailing wind and natural draft.

4. As the angle between the hot surface and cold surface decreases, more of the available energy is transferred between the two plates. The maximum radiant heat transfer occurs when the two plates are parallel.

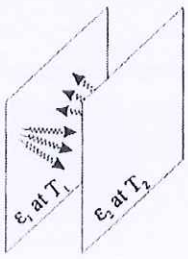
- This geometry frequently occurs in buildings (double-pane glazings, hollow core walls, suspended ceilings and roofs, etc.).



No Radiant Transfer
(Surfaces are in same plane)



Some Radiant Transfer
(Surfaces intersect)



Maximum Radiant Transfer
(Surfaces are parallel)

Section – C

03X03 = 09 Marks

1. The prevailing wind causes a high pressure on one side of the structure and a slight negative pressure on the opposite side.

- These two different pressures combine to force air into any opening on the upwind side and to pull air out of the building on the downwind side.
- 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.

2. Absorptance, ά the ratio of radiation absorbed by a surface to that incident on the surface.
Emittance,ε , the ratio of radiation emitted by a surface to that emitted by an ideal "black" surface at the same temperature
Reflectance, ρ, the ratio of radiation reflected by a surface to that incident on the surface

3. Spalling ,Cracking,Rain penetration, Moisture problems , Efflorescence ,Deficient thermal resistance.

- Deficiency in design
- Deficiency in construction
- Deficiency in maintenance

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of RAC Skills

V Semester, 1st In-Sem. Examination

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

Course Code: HVA1502 Time: 1 Hour

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

Instruction:

1. Attempt all Questions.

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

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Section – B

03X02 = 06 Marks

1. What is the difference between cold storage and cold chain?
2. What is food preservation?
3. Write down the different types of cold storages.

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.
3. Explain different types of insulation in detail.

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School of RAC Skills

V Semester, 1st In-Sem. Examination

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

ANSWER KEY

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

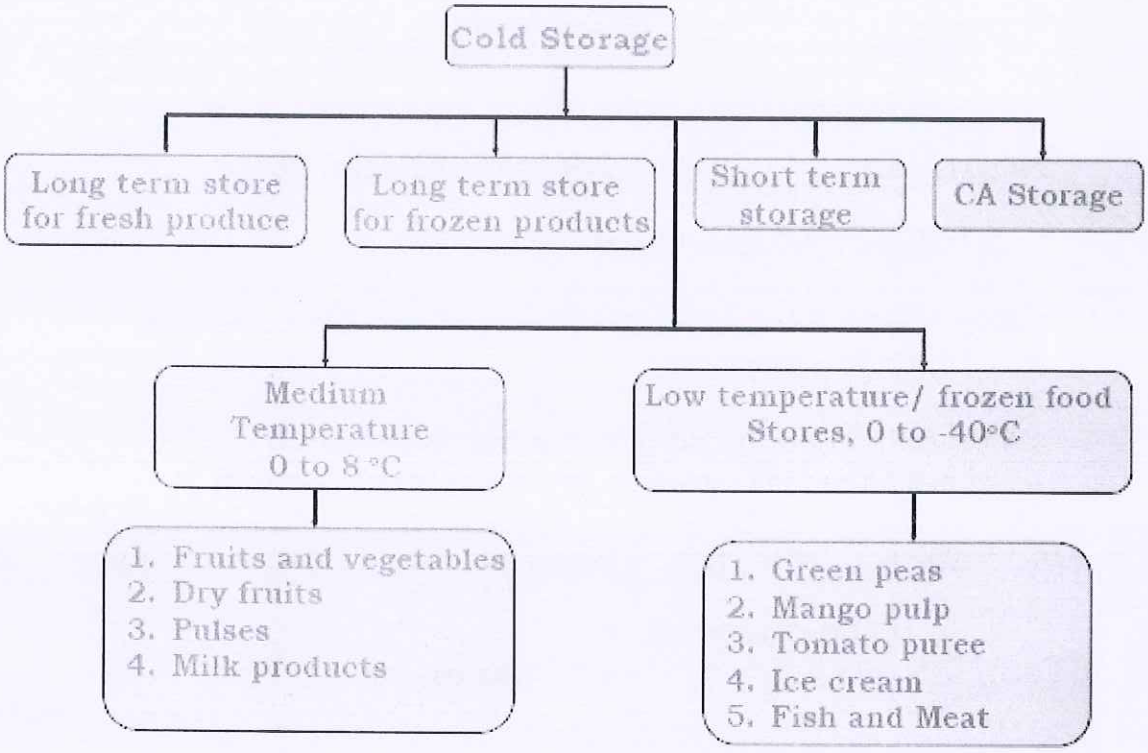
A cold chain warehouse (or cold chain storage) is a specialized structure that's always closed off and insulated from its external environment, and where conditions inside are carefully controlled. Cold chain warehouses (often referred to as ""cold storage"" or ""temperature controlled warehouses"") 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. What is food preservation?

   Retaining food over a period of time without being contaminated by pathogenic organisms or chemicals and without losing its colour, texture, flavour and nutritious value.

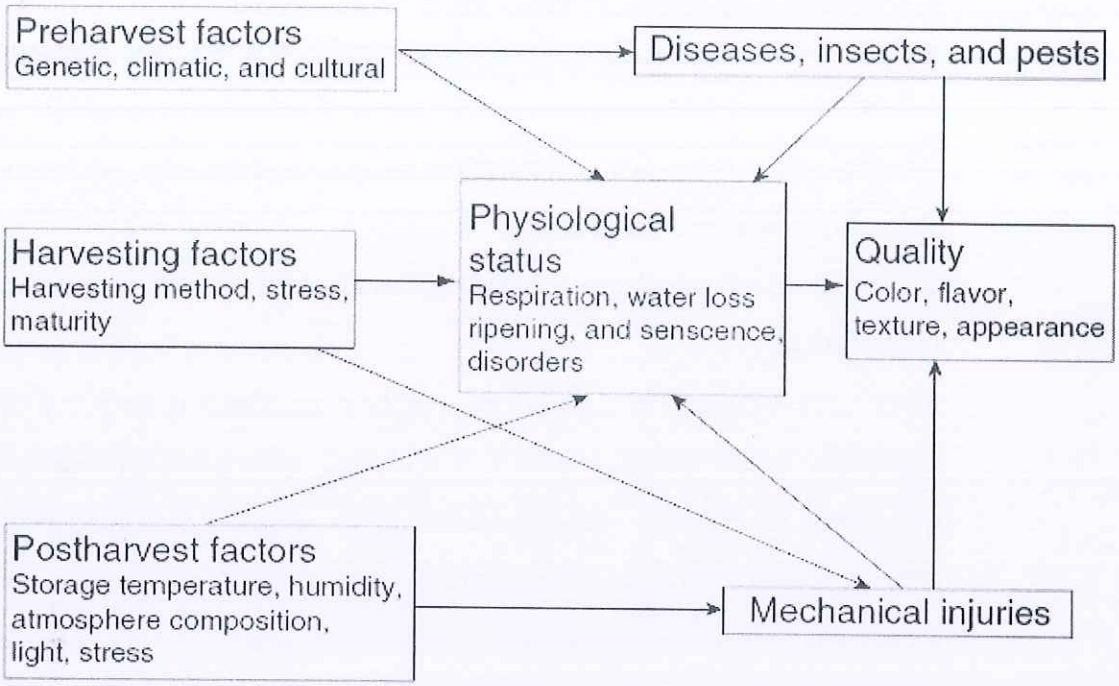
3. Write down the different types of cold storages.



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.

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Registration No.: .....

School of Refrigeration and Air-conditioning Skills

Session: 2020-21 (Winter Semester)

B. Voc. Program, V Semester,

2nd 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: Efficiency of engine-drive screw chiller is

A. 1.6 B. 1.9
C. 3.25 D. 5.8

Q. 2: Efficiency of Electric-drive air-cooled scroll chiller is

A. 1.6 B. 1.9
C. 3.25 D. 5.8

Q. 3: Chillers operate efficiently in range of

A. 30% to 60% load B. 40% to 80% load
C. 20% to 50% load D. 10% to 70% load

Q. 4: A vapour absorption refrigeration system

A. gives noisy operation B. gives quiet operation
C. requires more power consumption D. have more wear and tear

Q. 5: In aqua-ammonia and Li-Br water absorption refrigeration system, the refrigerants are respectively

A. water and water B. water and Li-Br
C. ammonia and Li-Br D. ammonia and water

Section – B

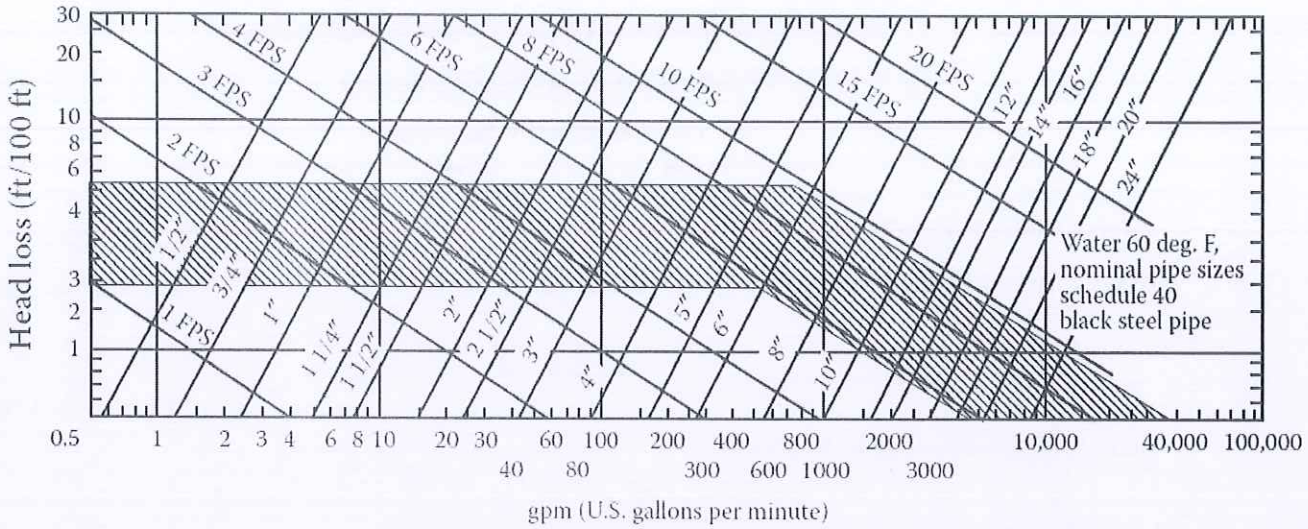
03*02 = 06 Marks

Note: Each question carries 02 mark.

Q. 1: Select the pipe sizes, having minimum and maximum head loss corresponds to 10000 GPM as shown in below figure. Write down head loss values also?

Q. 2: Explain line mounted and base mounted pumps.

Q. 3: What is the difference between symmetrical and asymmetrical chiller?



Section – C

03*03 = 09 Marks

Note: Each question carries 03 mark.

Q. 1: Explain series and parallel chiller system with neat sketch.

Q. 2: Explain vapour absorption refrigeration cycle with neat sketch.

Q. 3: Explain primary and secondary parallel configuration with neat sketch.

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Registration No.: .....

School of Refrigeration and Air-conditioning Skills

Session: 2020-21 (Winter Semester)

B. Voc. Program, V Semester,

2nd In-Sem. Examination

Course Code: HVA1503

Course Name: Chilled water supply system design

Time: 1 Hour

Max. Marks: 20

Section – A

05*01 = 05 Marks

05 objective type questions, each question carries 01 mark.

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

Answer key

Section – B

03*02 = 06 Marks

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

Q. 1: Select the pipe sizes, having minimum and maximum head loss corresponds to 10000 GPM as shown in below figure. Write down head loss values also?

Ans. Pipe size = 24" and head loss – 0.7 ft/100 ft (Minimum head loss)

Pipe size = 12" and head loss – 18 ft/100 ft (Maximum head loss)

Q. 2: Explain line mounted and base mounted pumps.

Ans. Line-mounted pumps: These pumps can be installed directly in the piping since the suction and discharge connections are arranged 180° apart. The motor and pump shafts, typically, are mounted vertically. The pump may be supported by the piping and/or by additional hangers or a foot stand.

Base-mounted pumps: Base-mounted pumps have the motor and pump shafts mounted horizontally, with both the pump and the motor bolted to a common frame or base. These pumps are available in two configurations.

Q. 3: What is the difference between symmetrical and asymmetrical chiller?

Ans. Symmetrical chiller: With this approach, all of the chillers are sized for equal capacity. The number of chillers and, thus, the size of the chiller "module" are based on the minimum anticipated load.

Asymmetrical chiller: There is no engineering rule that says that all chillers in a multichiller system have to be of the same size. While there may be some maintenance advantages (common parts, etc.), different-sized chillers can be operated together.

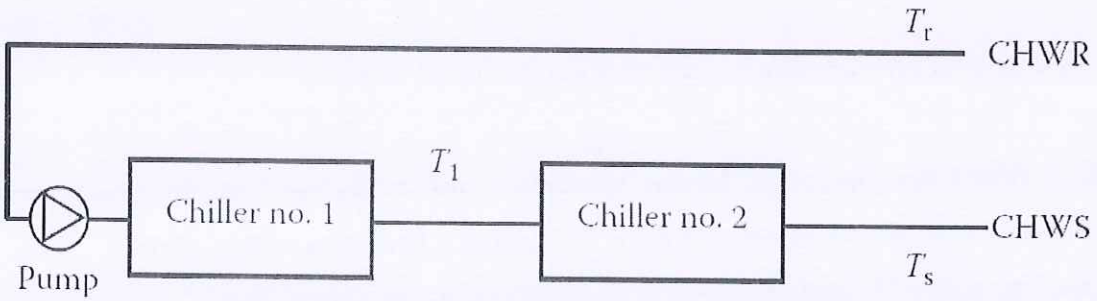
Section – C

03*03 = 09 Marks

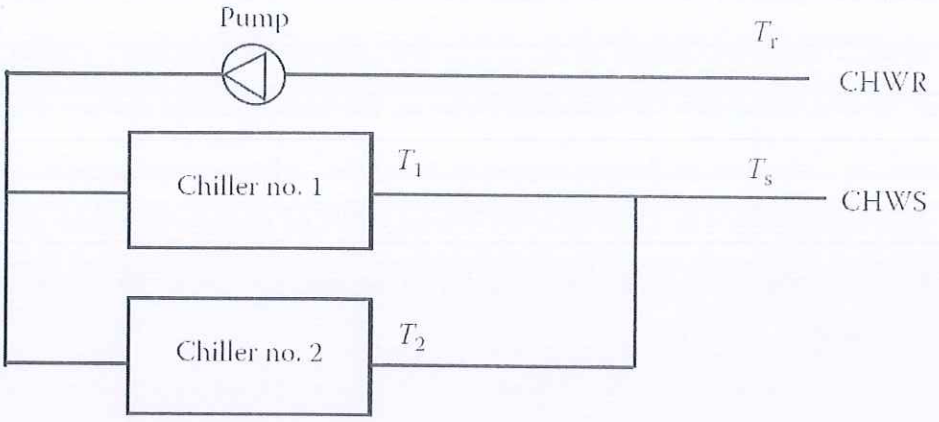
03 essay type questions, each question carries 03 marks.

Q. 1: Explain series and parallel chiller system with neat sketch.

Ans. Series chiller system: In a series configuration with two chillers, each chiller is selected to produce half of the required cooling at the full system flow rate. Thus, half of the total design range is produced by each chiller. Series chiller systems are rarely utilized in present times because this configuration requires a constant chilled water flow rate at all times, resulting in high pumping costs. But, if a relatively large temperature difference is required or if there is a very steady base cooling load, the series configuration may offer some advantages.



Parallel chiller system: The parallel chiller configuration is far more common. In a two-chiller configuration, each chiller is typically selected to operate with the same design range, but with only a half of the total system flow requirement. This again results in a 50/50 load split, but other load ratios may be selected if dictated by operational requirements. And, there is no real limitation on the number of parallel chillers that can be utilized in one system.



Q. 2: Explain vapour absorption refrigeration cycle with neat sketch.

Ans. In this system, the vapour refrigerant from the evaporator is drawn into an absorber where it is absorber by weak solution of the refrigerant forming a strong solution. This strong solution is pumped to the generator where it is heated by some external source (waste heat or solar energy). During the heating process, the vapour refrigerant is driven off by the solution and enters into the condenser where it is liquified. The liquid refrigerant then flows into the evaporator and thus the cycle is completed. The vapour absorption system uses heat energy, instead of mechanical energy as in VCRC. In VARS, the compressor is replaced by an absorber, a pump, a generator and a pressure reducing valve. These components in VARS perform the same function as that of a compressor in VCRC system.

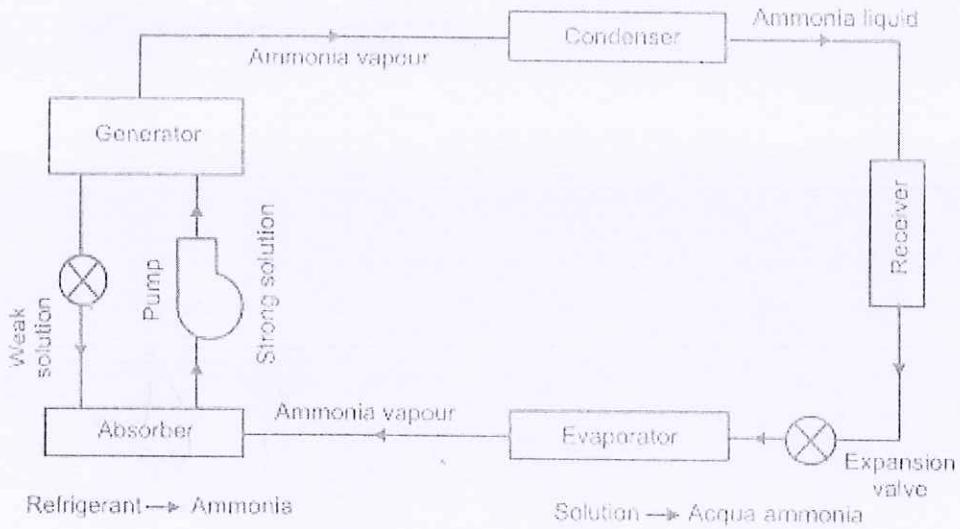
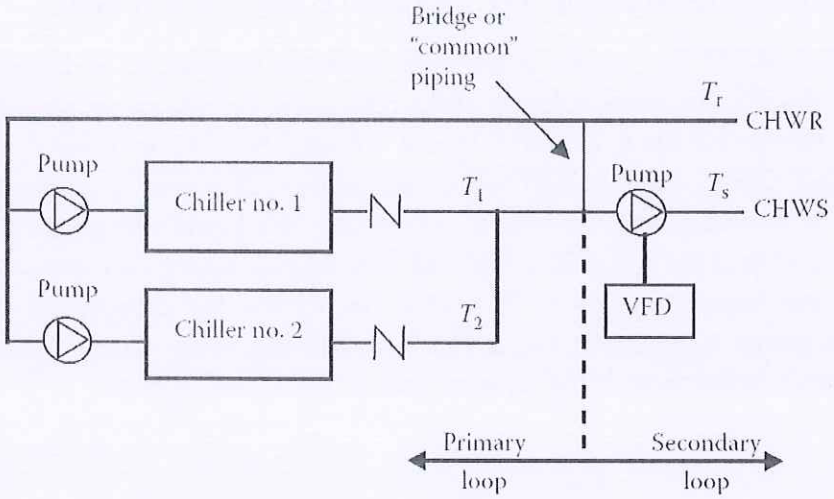


Fig. Vapour absorption refrigeration system

Q. 3: Explain primary and secondary parallel configuration with neat sketch.

Ans. In the primary–secondary variable flow piping arrangement, here, the production loop (primary loop) through the two chillers is hydraulically isolated from the distribution loop (secondary loop) by a piping bridge. The bridge is a short section of piping shared by both loops and designed to have little or no pressure drop. Thus, the flow in one loop is not affected by flow in the other. On the primary or production loop side, the system acts as

multiple-pump parallel chiller installation, as described earlier. Flow in this loop varies in "steps" as the chillers are staged on or off and their respective pumps are started and stopped. However, in the secondary or distribution loop, the cooling coils utilize two-way control valves and the distribution pump(s) utilize a variable frequency drive(s) (VFD) so that the chilled water flow rate is modulated from 0% to 100% of peak design flow as a function of the imposed cooling load. Thus, this loop has fully variable flow, but maintains a constant temperature range.



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BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Refrigeration& Air-Conditioning Skills
V Semester, 2nd In-Sem. Examination
B. Voc. Program, winter Semester(2020-21)

Course Code: HVA1504 **Time: 1 Hour**
Course Name: AC system and Testing **Max. Marks: 20**
Instruction: Calculators are allowed, write units also

Section – A

05X01 = 05 Marks

Q1. Based on Pressure Duct are classified as_____?
a) Class a, b,c b) series a,b,c
c) Class I,II & III d) Series I,II,III

Q2. Pressure range for _____ Friction values up to 3 ¼ water column?
a) Class-I b) Class-II
c) Class-III d) E-class

Q3. On the basis of velocity _____ Is ranged as high velocity?
a) up to 1500 FPM b) 1500-2500 FPM
c) above 2500 Fpm d) above or equal to 3500 FPM

Q4. Nacph value is taken in consideration for _____?
a) Air change of complete volume b) Air change of complete area
c) Air change of complete pressure d) all the above

Q5. In equal friction method we take duct length for pressure drop equivalent to _____
a) per 10ft b) per 100ft
c)per 50ft d) per 1000 ft

Section – B

03X02 = 06 Marks

Q6. Draw the flow chart for Project Flow matrix?

Q7. What are the Advantages of velocity design in a system and why it is typical?

Q8. Using the continuity equation calculate the sizes of square duct?

whose area is.

1) 49 sq ft 2) 441 sq inches
3) 64 sq ft 4) 225 sq inches

Section – C

03X03 = 09 Marks

Q9. What are the types of Air Ventilation Explain with the help of A neat sketch?

Q10. For the given drawing calculate the following: -

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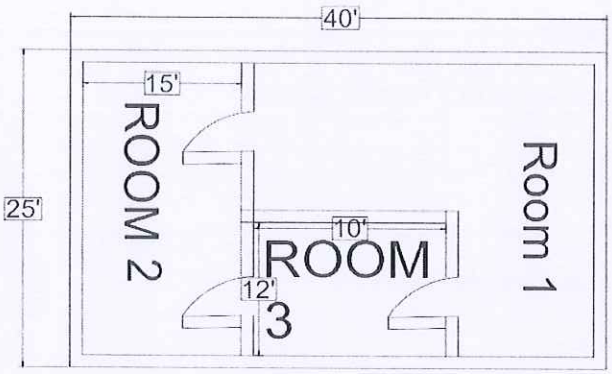
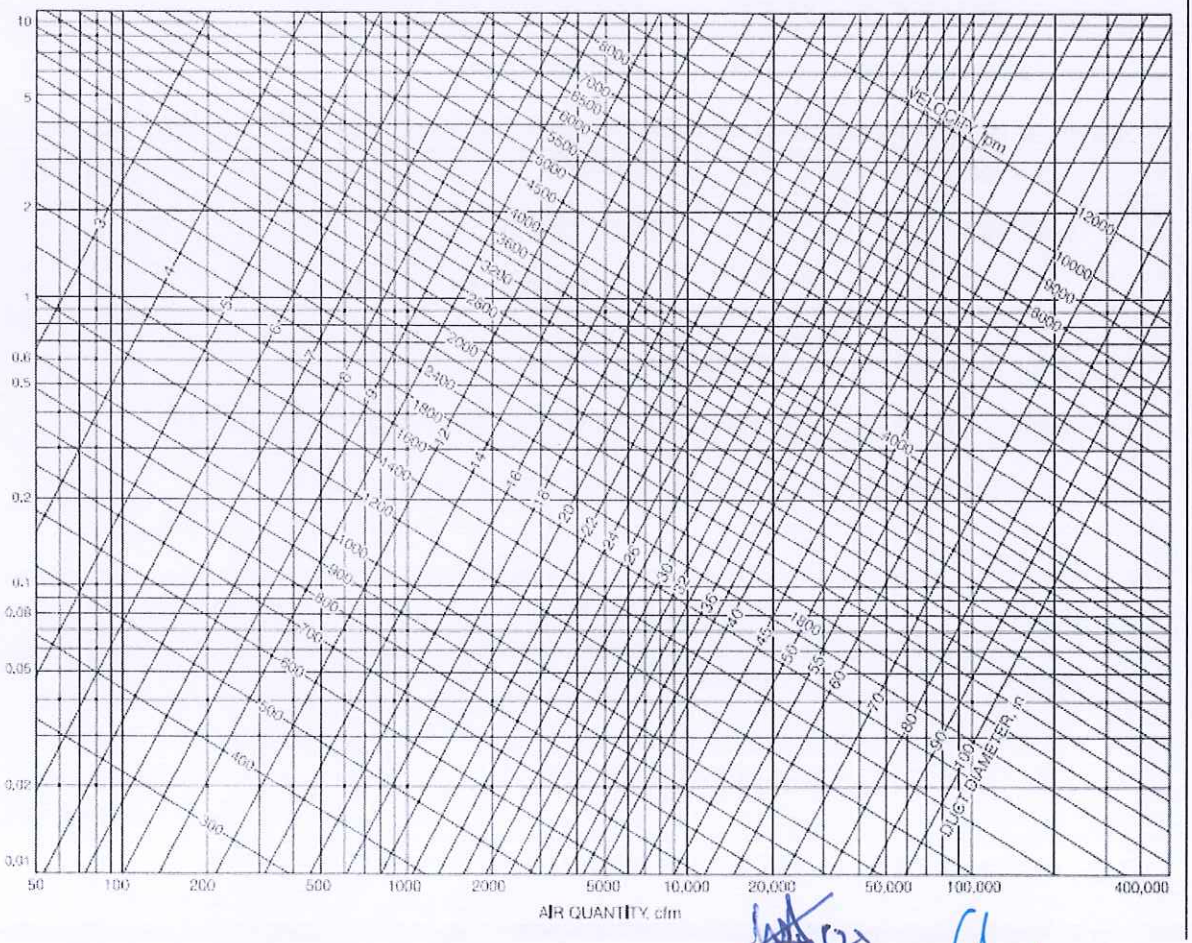
SRNO	AREA	VOLUME	REQUIRED CFM	Velocity	Round duct Dia. meter
1	Room 1				
2	Room 2				
3	Room 3				

Q11. For the above question Write the rectangular duct dimensions with square duct sizing For all three rooms?

All dimensions are in feet





Friction loss in inches of water/100 ft
Friction chart for Round Duct (ε = 0.0003 ft.)

Figure 2.7 : Rigid Duct Design - Friction Chart
Friction chart for Round Duct, Air Density = 0.075 lb/ft3 and ε = 0 0.003 ft.

Source : ASHRAE Handbook 2013

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School of Refrigeration& Air-Conditioning Skills
I Semester, 2nd In-Sem. Examination
B. Voc. Program, winter Semester (2020-21)

Course Code: HVA1504 **Time: 1 Hour**
Course Name: AC System and Testing **Max. Marks: 20**
Instruction: Calculators are allowed, write units also

Section – A

05X01 = 05 Marks

Q1. Based on Pressure Duct are classified as_____?
c) Class I,II & III

A2. Pressure range for _____ Friction values up to 3 ¼ water column?

a) Class-I

Answer key

Q3. On the basis of velocity _____ Is ranged as high velocity?

c) above 2500 Fpm

Q4. Nacph value is taken in consideration for _____?

a) Air change of complete volume

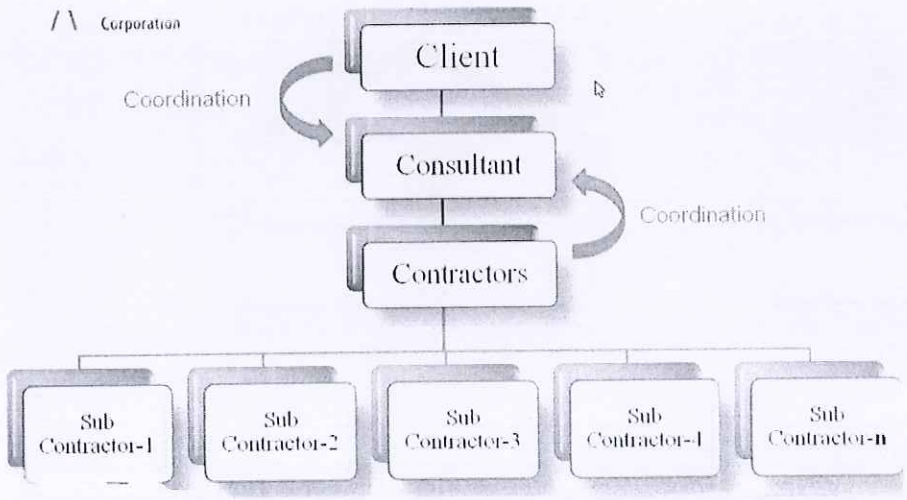
Q5. In equal friction method we take duct length for pressure drop equivalent to _____

b) per 100ft

Section – B

03X02 = 06 Marks

Q6. Draw the flow chart for Project Flow matrix?



Q7. What are the Advantages of velocity design in a system and why it is typical?

A7. It helps us in following ways.

1. Reduce duct sizes.
2. Reduces fan operational cost.
3. Help us in optimizing the system.
   Its is typical as to balance we need dampers and experienced skilled person for making a project to balance each duct is difficult .it requires manipulation of Standards and hit trial method for balancing

Q8. Using the continuity equation calculate the sizes of square duct?

whose area is.

1) 49 sq ft= 7ft x7ft 2) 441 sq inches=21" x 21"

3) 64 sq ft= 8ft x 8ft 4) 225 sq inches= 15 "x15"

Section – C

03X03 = 09 Marks

Q9. What are the types of Air Ventilation Explain with the help of A neat sketch?

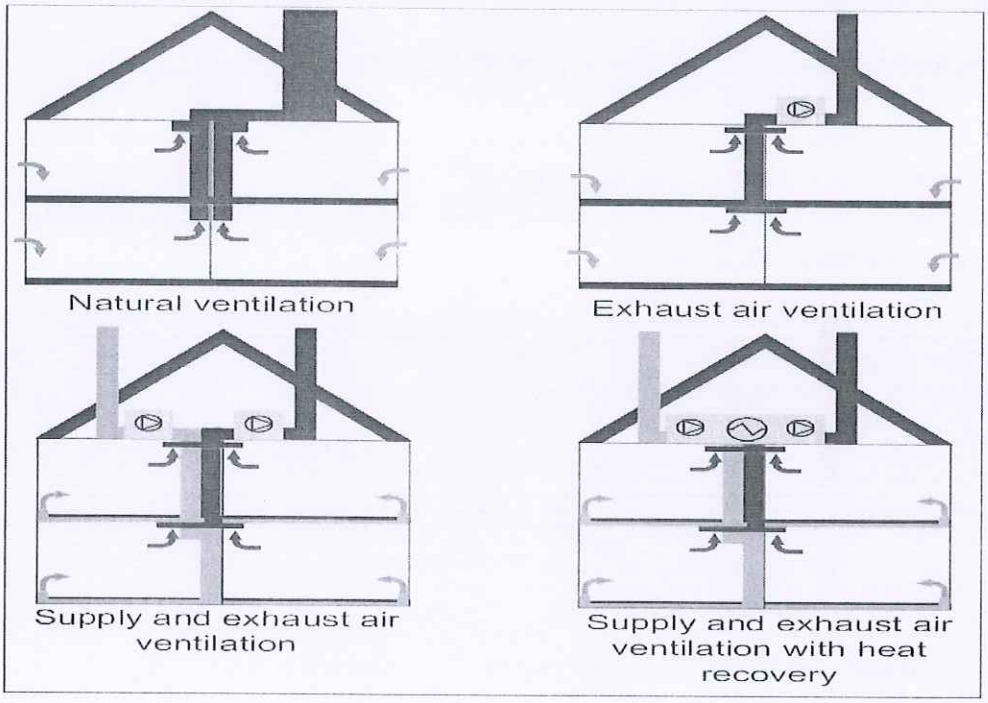
Ventilation is the Exchange of Room air with Fresh air. Sending Foul air out from the room/space and supplying fresh air into the room/space. Ventilation is a vital requirement for the comfort and health of building occupants.

There are 2 methods that may be used to ventilate a building.

Natural Ventilation

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

Forced ventilation 1) positive pressure 2) Horizontal Mechanical 3) Hydraulic



Q10. For the given drawing calculate the following: -

SRNO	AREA	VOLUME	REQUIRED CFM	Round duct Dia. meter	Velocity FPM
1	Room 1	672	34	5"	500
2	Room 2	800	40	5"	500
3	Room 3	440	22	5"	500

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Q11. Answer are cfm/velocity =34/500= .068 = so inches 10" x 10" room 1

Room2 -4"x4"

Room3 5"x5"

15/7/21