

CBSE – DEPARTMENT OF SKILL EDUCATION

AIR-CONDITIONING & REFRIGERATION (SUBJECT CODE-827)

Sample Question Paper with Marking Scheme

Class XII (Session 2019–2020)

Time: 3 Hours

Max. Marks: 60

General Instructions:

1. This Question Paper consists of two parts viz. Part A: Employability Skills and Part B: Subject Skills.

Part A: Employability Skills (10 Marks)

- i. Answer any 4 questions out of the given 6 questions of 1 mark each.
- ii. Answer any 3 questions out of the given 5 questions of 2 marks each.

Part B: Subject Skills (50 Marks):

- iii. Answer any 10 questions out of the given 12 questions of 1 mark each.
 - iv. Answer any 5 questions from the given 7 questions of 2 marks each.
 - v. Answer any 5 questions from the given 7 questions of 3 marks each.
 - vi. Answer any 3 questions from the given 5 questions of 5 marks each.
2. This question paper contains 42 questions out of which 30 questions are to be answered.
3. All questions of a particular part/section must be attempted in the correct order.
4. The maximum time allowed is 3 hrs.

PART A: EMPLOYABILITY SKILLS (10 MARKS)

Answer any 4 questions out of the given 6 questions of 1 mark each:

1.	_____ signals are the part of body language, Non - Verbal Communication. a. Eye Contact b. Aura / Vibes c. Facial Expressions d. All of the these Answer - d. All of these	(1)
2.	Physiological motivation directs the behaviour towards satisfying specific _____ need. Answer- Bodily	(1)
3.	A workbook, by default, opens how many worksheets. a) 4 b) 3 c) 2 d) 5 Answer – b) 3	(1)

4.	Identify the types of Business Activities. a) Manufacturing, Trading, Services b) Trading, Services, Marketing c) Services, Trading, Approaching customers d) Manufacturing, Services, Maintenance Answer : - a. Manufacturing, Trading, Services	(1)
5.	'Tourists are buying experience not product'. The given statement is appropriate for which sector of green jobs? a. Tourism b. Building and construction c. Solar and wind power Ans- Tourism	(1)
6.	Personality is relatively enduring set of _____. Answer- Traits	(1)

Answer any 3 questions out of the given 5 questions of 2 marks each:

7.	How is the Active Listening important for a worker? Answer- It helps the worker to truly understand what people are saying in conversations and meetings. It helps to build rapport with the interviewer. It can redirect one's focus from what is going on inside one's head to the needs of the prospective employer or interviewer. It can also help reduce your nervousness during an interview.	(2)
8.	Describe physiological motivation? Answer – Physiological motivation - A body need such as food or water that initiates behavior directed toward satisfying the particular need.	(2)
9.	Write down the steps to change the row height. Answer- Select Format → Row → Height. The Row Height dialog box appears. Enter the value for row height in the Height box.	(2)
10.	Discuss any two types of customer needs. Ans- Any two of the following: a) Served Needs: These are needs that customers know and are fulfilled by different businesses or the government. For example, the need of travelling from one place to the other is taken care of by both, private bus services and government bus services. b) Partially-served Needs: These are needs which are served through different products or services, but the customer is not completely satisfied and still faces problems while using. For example, people always used taxis and auto rickshaws to go to different places, but they face problem in finding one on time, and paying a reasonable amount for it. c) Unserved and Known Needs: These needs are known by the customers, but not fulfilled by anyone in the market. For example, people in small towns do not have electricity supply at all times, and therefore their children cannot study after sunset. A company realized this problem and created solar-lamps, which get charged during the day and can be used at night. d) Unknown Needs: These are needs that people have, but are not aware or do not expect for it to get solved by a business. For example, people 10 years ago did not know	(2)

	that it will be possible to make video-calls across cities or countries. But through innovation, entrepreneurs and innovators found the technology to make this happen.	
11.	Provide list of any four green jobs in building and construction sector. Ans- (Any four of the following) a. Construction worker b. Carpenter c. Building planner and coordinators d. Insulators e. Weatherization f. Concrete labours g. Highway laborers h. Demolition experts.	(2)

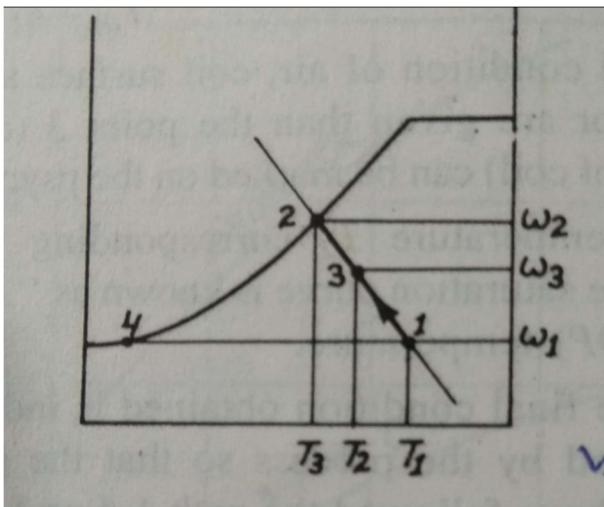
PART B: SUBJECT SKILLS (50 MARKS)

Answer any 10 questions out of the given 12 questions:

12.	Define Psychrometry. Ans. The study of mixture of air and water vapour is called psychrometry.	(1)
13.	Define Humidification. Ans. Addition of water vapour/moisture to air is called humidification.	(1)
14.	Define Conduction. Ans. Conduction is a mode of heat-transfer in which. Transfer of heat takes place between two bodies (solids) due to direct contact between them.	(1)
15.	Heat always flows from _____ to low _____ by itself. Ans. 1. high temperature 2. temperature.	(1)
16.	Combined effect of _____ and _____ is used in evaporative condensers for removal of heat of vapour Refrigerant. Ans. 1. water, 2. air	(1)
17.	_____ type condensers are used in beverage industries. Ans. Tube- in-tube type/ Double pipe.	(1)
18.	Low pressure cut-out is used as _____ and _____ in Refrigeration plants. Ans. 1 a safety control, 2. as a temperature control.	(1)
19.	Over load protector is connected in _____ with motor in a refrigerator. Ans. series.	(1)
20.	_____ tanks are used to remove Ice from Ice-cans. Ans. Dip	(1)
21.	_____ is used in an Ice-plant as a secondary refrigerant. Ans. Brine.	(1)
22.	F.C.U. is used in an _____ air-Conditioning system. Ans. all water /direct expansion(DX)	(1)

23.	A.H.U. is used in an _____ air-conditioning system. Ans. all air	(1)
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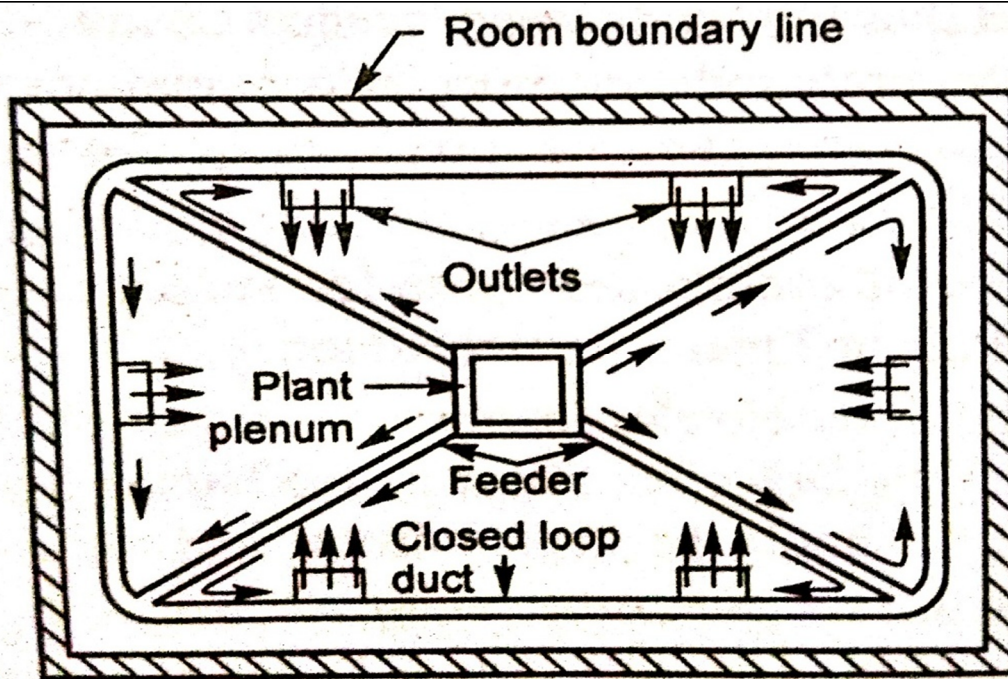
Answer any 5 questions out of the given 7 questions of 2 marks each:

24.	<p>Explain cooling with adiabatic humidification and show the process on psychrometric chart.</p> <p>Ans. When the air is passed through a spray chamber a part of the water will be evaporated and is carried with the air by increasing the specific humidity of air. The heat required for the evaporation of water carried with the air is taken from the air itself by decreasing the temperature of the air and the total heat of the air remains constant. The process is shown on psychrometric chart as :-</p>  <p style="text-align: center;">DBT</p> <p style="text-align: center;">(Adiabatic Humidification of air on psychrometric Chart)</p>	(2)
25.	<p>What do you mean by cooling load and air-quantities?</p> <p>Ans. The air-circulated in the room must be adequate to take the load from the air-conditioned room. The outlet condition of the air is fixed as per the comfort requirements in the room. The condition of the air (DBT) entering the room must be such that it must be able to take the load in the room. The lower the supply air temperature less the quantity of air required to be circulated.</p>	(2)
26.	<p>Explain the function of a Drier used in a refrigeration system.</p> <p>Ans. Drier is a device used to remove moisture from refrigerant, generally, placed in liquid line. It is made of steel or brass in the shape of a shell equipped with inlet and outlet openings. A strainer is provided at the outlet of the shell. It is charged with some moisture absorbing chemicals like- Silica Gel.</p>	(2)
27.	<p>What is brine? Explain why it is used in refrigeration?</p> <p>Ans. Brine is a solution containing the salt in dissolved condition in water. When the temperature required to be maintained is below the freezing point of water. Then the water cannot be used as secondary refrigerant. In such cases, brine solutions are commonly used as a secondary refrigerant.</p>	(2)
28.	<p>Explain the function of overload protector in a refrigerator.</p> <p>Ans. The basic function of the overload protector is to protect compressor motor winding from damage due to high current drawn, overheating and over load conditions.</p>	(2)

29.	<p>Explain why the refrigeration system is used in Dairies? Ans. Refrigeration system is used in dairies particularly for preservation of dairy products like milk and butter etc. Milk preservation includes blending, processing, packaging and distribution to the consumers.</p>	(2)
30.	<p>What is a Fan-coil unit(FCU)? Ans. Fan-coil units are the assembly of coils for Cooling and de-humidifying, either for chilled water or direct expansion of refrigerant along with a fan for circulation of conditioned air to the room.</p>	(2)

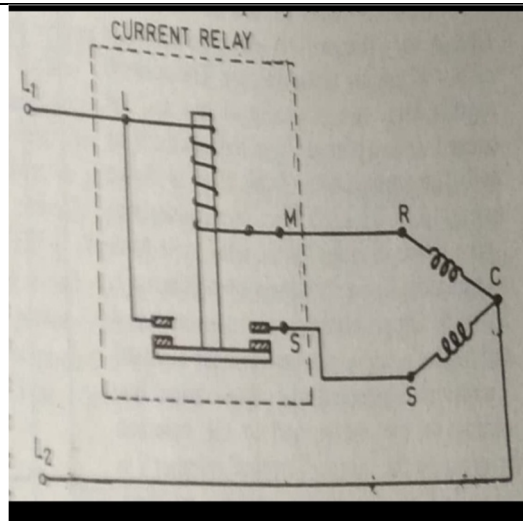
Answer any 5 questions out of the given 7 questions of 3 marks each:

31.	<p>Explain the psychrometric process which can be used for summer Air-conditioning with the help of psychrometric chart. Ans. Cooling with de-humidification process is used for Summer air-conditioning. In this process the removal of water vapour from the air is accomplished/achieved by passing the air over a cooling coil whose temperature is maintained below the dew point temperature (D.P.T.) of air. the process is shown on a psychrometric chart as below:-</p> <div data-bbox="470 869 1129 1388" data-label="Figure"> </div> <p style="text-align: center;">“Cooling with de-humidification”</p>	(3)
32.	<p>What is a Duct? Explain loop perimeter duct layout system with a neat sketch. Ans. Channels for supply and return air are known as ducts. Loop perimeter duct system:-The conditioned air from conditioning plant plenum is carried in several feeder ducts to a common continuous closed loop duct around the perimeter of the building the required no of outlets are connected with the common room to receive their supply of conditioned air.</p>	(3)



Loop Perimeter Duct Layout System

<p>33.</p>	<p>What is a Refrigerant? Explain the properties of Ammonia (NH₃) as refrigerant. Ans. A refrigerant is a substance which will absorb the heat from the source (low temp) and dissipate the same to the sink (high temp) either in the form of sensible heat or in the form of latent heat. Properties of Ammonia(NH₃) as refrigerant:- (1.) It is toxic, flammable, irritating and food destroying. (2.) It has low volumetric displacement, low cost, low weight of liquid refrigerant per ton of refrigeration and high efficiency. (3.) Ammonia attacks on non-ferrous metals in the presence of water therefore copper and brass are never used with ammonia refrigeration system. (Any other suitable property)</p>	<p>(3)</p>
<p>34.</p>	<p>Explain different methods which are used for defrosting. Ans. The following methods of defrosting are commonly used:- (1) Manual defrosting. (2) Automatic periodic defrosting. (3) Water defrosting. (4) Automatic hot gas defrosting. (5) Thermo bank defrosting. Etc.</p>	<p>(3)</p>
<p>35.</p>	<p>Explain current type starting relay with a neat sketch. Where it is commonly used. Ans. Current type starting relay is normally used with the motors which are 0.5 kw in capacity or less. This relay is electromagnetic type. The coil of relay is connected in series with motor run winding. The contacts of the relay are normally open. These relays must be so installed that the weighted armature that carries the contacts will function by gravity pull.</p>	<p>(3)</p>

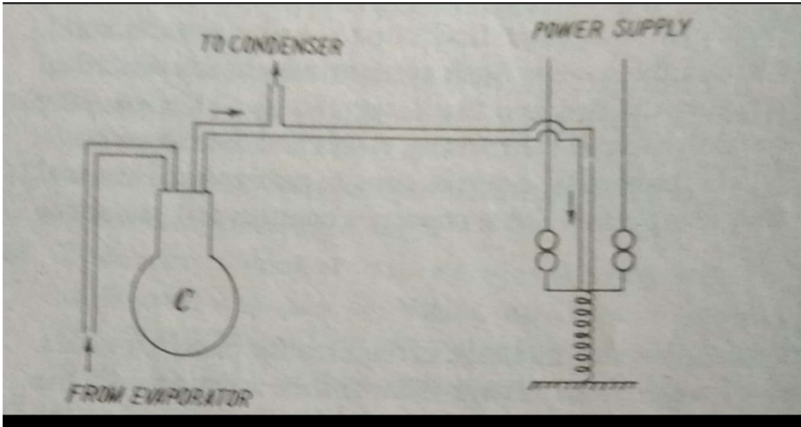


Current Type Starting Relay

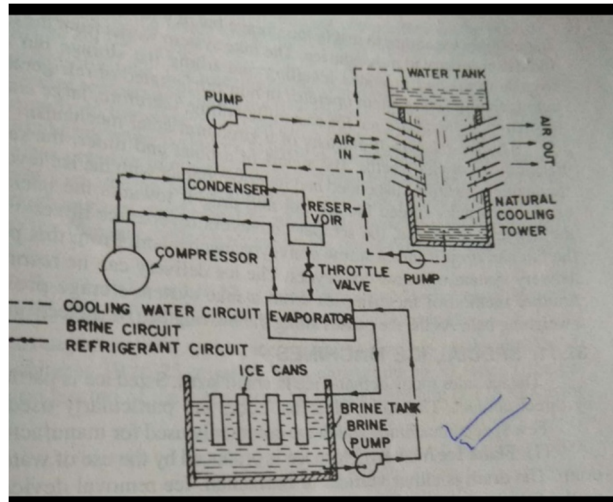
36.	<p>Write a short note on cold-storage.</p> <p>Ans. The essential components of a cold storage plant are:- compressor, condenser, expansion device and evaporator for small cold storages the rooms are cooled by air. The warm air from the room is drawn in at the bottom, it passes over the coils of evaporator and chilled air is blown out in the room through the directing louvers. Such units use direct refrigerant in their cooling coils or brine is circulated in which case secondary coils are to be provided. For large cold storages the rooms are cooled by brine which is cooled at control point and pumped through pipes to the respective rooms.</p>	(3)
37.	<p>How the leaks of halocarbon refrigerants detected explain.</p> <p>Ans. Leaks of Freon/halocarbon refrigerants are detected with a halide (alcohol) torch. If the intake tube of the halide torch is brought near the leaking joint, then the leaking gas will enter into intake tube of the torch and gives a green hue. Which is a sure indication of a gas leak.</p>	(3)

Answer any 3 questions out of the given 5 questions of 5 marks each:

38.	<p>What is an insulating material? Explain the properties of insulating materials.</p> <p>Ans. The substances which are used to retard the heat transfer between cold spaces and warm surroundings are commonly known as thermal insulating materials they isolate the warm surrounding from cold refrigerated spaces. The properties of the thermal insulating materials which are used in refrigerating systems to insulate refrigerated spaces from surroundings can be grouped as:-</p> <ol style="list-style-type: none"> (1) Thermal properties (2) Mechanical properties (3) Physical properties <p>(1.) Thermal properties:- The ability of a material to retard the flow of heat is given by its thermal conductivity. The thermal conductivity is a property of a homogeneous material which changes with the variation of density. A compressible substance such as glass wool, if loosely packed, is a better insulator than if closely packed. The other important thermal properties are specific heat capacity, thermal diffusivity etc.</p> <p>(2.) Mechanical properties:- The mechanical properties of an insulating material includes strength in compression, tension, shear, impact and flexure. These properties become important when some insulating materials are also to be used as load bearing floors and to form self-supporting partitions.</p> <p>(3.) Physical properties:- These properties include permanence, low odour level, moisture resistance, safety to health, inflammability, repulsion to insects & vermin.</p>	(5)
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<p>39.</p>	<p>Write the names of different refrigerant control devices. Give advantages and disadvantages of capillary as an expansion device as compared to an expansion valve. (5)</p> <p>Ans. The different refrigerant control devices are:-</p> <ol style="list-style-type: none"> (1.) Capillary tube (2.) Thermostatic Expansion valve (3.) Automatic expansion valve (4.) High side float valve (5.) Low side float valve (6.) Solenoid valve <p>Advantages of capillary tube as compared to expansion valve:-</p> <ol style="list-style-type: none"> (1.) It is simple in construction. (2.) No maintenance is required. (3.) Cheap and economical. (4.) System does not require receiver. <p>Disadvantages of capillary tube as compared to expansion valve:-</p> <ol style="list-style-type: none"> (1.) The refrigerant must be free from moisture and dirt otherwise it will choke the tube and stop the flow of refrigerant. (2.) Only can be used with small capacity units. (3.) It cannot be used with high fluctuating load conditions. 	
<p>40.</p>	<p>Where and why a high pressure cut-out is used? Explain the working of a H.P. cut-out with a neat sketch. (5)</p> <p>Ans. This control is used as safety control in high capacity refrigeration plants using water cooled condensers because there is every possibility of sudden water supply failure. This increases the discharge pressure rapidly.</p> <p>Working: - The compressor is stopped by cutting off the power supply given to the motor of the compressor whenever the discharge pressure of the compressor becomes excessive when the pressure in the discharge line rises above a certain predetermined pressure, the high pressure control operates and stops the compressor by cutting off the power supply given to the compressor motor. When the pressure returns to normal, the control acts to close the power supply and starts the compressor.</p>  <p style="text-align: center;">High-Pressure Cut-Out</p>	
<p>41.</p>	<p>What are the different commercial applications of refrigeration? Draw a layout of an Ice-plant. (5)</p> <p>Ans. Different commercial applications of refrigeration are:-</p> <ol style="list-style-type: none"> (1.) Ice-plants, 	

- (2.) Cold-storages,
- (3.) Dairy Refrigeration,
- (4.) Ice-cream manufacture,
- (5.) Transport refrigeration etc.



(Lay-out of an Ice-plant)

42. What is an Air-conditioning system? Give classification of Air-conditioning systems.
 Ans: An air-conditioning system is defined as an assembly of different parts of the system used to produce a specified condition of air within a required space or building.

(5)

The air-conditioning systems are mainly classified as :-

1. Central station air- conditioning system.
2. Unitary air-conditioning system.
3. District air-conditioning system.
4. Self-contained air-conditioned units.

Another method of classifying the air-conditioning system is the type of fluid used either for heating or cooling. Air-conditioning systems classified as per fluid used are :-

- (1.) Direct expansion system.
- (2.) All- water systems.
- (3.) All- air systems.
- (4.) Combined systems.
- (5.) Heat pump systems.