TY B VOC REFRIGERATION AND AIR CONDITIONING

SUBJECT: RAC Maintenance - II SEM I

Notes for END SEM Examination

Que 1 Multiple choice Questions (Unit 3,Unit 4 & Unit 5)

Unit III: Charging the System, Compressor Work, Expansion Valve, Servicing, Hermetic Compressor Motors, and Sealed System Connections

1. **What is the primary function of the expansion valve in a refrigeration system?**
- A) To increase the pressure of the refrigerant
- B) To reduce the pressure and temperature of the refrigerant
- C) To circulate refrigerant through the evaporator
- D) To regulate the compressor's speed
- **Answer: B** - The expansion valve reduces the pressure and temperature of the refrigerant, allowing it to evaporate in the evaporator.

2. **Which of the following is a common problem associated with hermetic compressor motors?**
- A) Overheating due to excessive oil levels
- B) Low refrigerant pressure
- C) Electrical faults due to poor insulation
- D) Leaking refrigerant from the evaporator coil
- **Answer: C** - Hermetic compressor motors are often prone to electrical faults due to poor insulation or damaged windings.

3. **When servicing a refrigeration system, which of the following steps should be taken to repair leaks?**
- A) Install a new expansion valve
- B) Use a leak detector and apply a sealant to the affected area
- C) Increase the refrigerant charge
- D) Replace the compressor immediately

- **Answer: B** - Leak detection should be done using a leak detector, and sealants or proper repairs should be applied to the affected area.

4. **What is the correct method to charge a refrigeration system?**

- A) Charge the system with the compressor running, and ensure it is under full vacuum
- B) Charge the system when it is at the minimum operating temperature
- C) Charge the system only after replacing the compressor
- D) Charge the system with the compressor off, using the expansion valve to regulate flow
- **Answer: A** - The system should be charged with the compressor running, and a vacuum should be drawn before charging to remove air and moisture.

Unit IV: Electrical Fault Finding

5. **If a compressor motor fails to start, which of the following is the most likely cause?**

- A) Faulty thermostat
- B) Open circuit in the compressor windings
- C) Low refrigerant charge
- D) Dirty condenser coils
- **Answer: B** - An open circuit in the compressor windings can prevent the compressor motor from starting.

6. **If a compressor motor tries to start but does not run, what is the most probable cause?**

- A) Faulty pressure cut-out switch
- B) Broken capacitor or relay
- C) Low refrigerant levels
- D) Clogged expansion valve
- **Answer: B** - A broken capacitor or relay can prevent the compressor motor from running, even if it tries to start.

7. **When a compressor motor starts but does not reach running speed, the issue is most likely related to:**

- A) A defective thermostat
- B) Inadequate refrigerant charge
- C) A faulty compressor motor winding

- D) Low voltage supply to the motor
- **Answer: D** - A low voltage supply to the compressor motor can cause it to start but not reach its normal running speed.

8. **What is a common failure type of thermostats in refrigeration systems?**

- A) Short circuit due to condensation
- B) Mechanical failure of the temperature sensing element
- C) Increased resistance in the contacts
- D) Complete electrical burnout
- **Answer: B** - A common failure in thermostats is the mechanical failure of the temperature sensing element, causing improper temperature regulation.

9. **Which of the following is a likely cause of pressure cut-out failure?**

- A) Incorrect refrigerant charge
- B) A clogged filter-drier
- C) Faulty electrical wiring to the thermostat
- D) A defective pressure switch or relay
- **Answer: D** - A defective pressure switch or relay can cause the pressure cut-out to malfunction, affecting system operation.

Unit V: Mechanical Fault Finding

10. **When diagnosing faults in refrigeration systems, what can temperature and pressure measurements help determine?**

- A) The type of refrigerant used
- B) The presence of leaks in the system
- C) The location of the faulty thermostat
- D) The operation status of the compressor
- **Answer: B** - Temperature and pressure readings can help identify leaks or other issues, such as undercharging or overcharging of refrigerant.

11. **Which method is most commonly used to confirm a fault in a refrigeration system?**

- A) Visual inspection only
- B) Comparing pressure and temperature readings against standard values

- C) Relying on sound from the compressor
- D) Using a voltage meter on the thermostat
- **Answer: B** - Pressure and temperature readings are compared against standard operating values to confirm faults.

12. **If a compressor is not running, which of the following steps should be taken first?**

- A) Check the voltage at the compressor motor terminals
- B) Replace the expansion valve
- C) Increase the refrigerant charge
- D) Inspect the thermostat for faults
- **Answer: A** - Checking the voltage at the compressor motor terminals ensures that the motor is receiving the correct power supply.

13. **Abnormal noise from the compressor typically indicates which of the following?**

- A) Low refrigerant charge
- B) Dirty evaporator coil
- C) Mechanical failure or wear within the compressor
- D) Incorrect thermostat setting
- **Answer: C** - Abnormal noise is often a sign of **mechanical failure** or wear within the compressor, such as damaged bearings or pistons.

14. **What is the most common fault in domestic refrigeration systems?**

- A) Refrigerant leaks
- B) Power supply issues
- C) Faulty thermostats
- D) Compressor failure
- **Answer: A** - The most common fault in domestic refrigeration systems is **refrigerant leaks**, which can cause the system to lose efficiency and fail to cool properly.

Q. 2 Match the pair

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Unit III: Charging the System, Compressor Work, Expansion Valve, Servicing, Hermetic Compressor Motors, and Sealed System Connections

Match the following:

Column A	Column B
1. Charging the system	A. Reduces refrigerant pressure and temperature
2. Compressor work	B. Common issue: electrical faults or overheating
3. Expansion valve (thermostatic)	C. Done to remove air and moisture before adding refrigerant
4. Hermetic compressor motors	D. Controls refrigerant flow based on temperature
5. Repairing leaks	E. Sealing leaks in joints and fittings
6. Sealed system connections	F. Necessary for effective and reliable system operation

Answer:

1. Charging the system → C. Done to remove air and moisture before adding refrigerant
2. Compressor work → B. Common issue: electrical faults or overheating
3. Expansion valve (thermostatic) → D. Controls refrigerant flow based on temperature
4. Hermetic compressor motors → B. Common issue: electrical faults or overheating
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Unit IV: Electrical Fault Finding

Match the following:

Column A	Column B
1. Compressor motor fails to start	A. Potential electrical connection issues, check wiring and capacitor
2. Compressor motor tries to start but does not run	B. Faulty relay or capacitor failure
3. Compressor motor starts but does not reach running speed	C. Low voltage or supply issues causing insufficient power

Column A	Column B
4. Thermostat failure type	D. Mechanical or electrical failure in the thermostat sensor
5. Pressure cut-out failure	E. Fault in the pressure control switch or sensor
6. Wiring and connection faults	F. Check for damaged wires, loose connections, or short circuits

Answer:

1. Compressor motor fails to start → A. Potential electrical connection issues, check wiring and capacitor
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Unit V: Mechanical Fault Finding

Match the following:

Column A	Column B
1. Fault analysis by temperature and pressure	A. Confirm fault by checking pressure/temperature readings
2. Methods of confirming the fault	B. Inspecting components and measuring temperature and pressure
3. Finding the fault when the compressor is not running	C. Check for electrical faults or mechanical blockages
4. Abnormal noise problem	D. Mechanical failure in compressor or loose components
5. Domestic system faults	E. Issues with refrigerant flow, thermostat, or electrical problems

Answer:

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SUBJECT: RAC Maintenance - II SEM I

1. Fault analysis by temperature and pressure → A. Confirm fault by checking pressure/temperature readings
2. Methods of confirming the fault → B. Inspecting components and measuring temperature and pressure
3. Finding the fault when the compressor is not running → C. Check for electrical faults or mechanical blockages
4. Abnormal noise problem → D. Mechanical failure in compressor or loose components
5. Domestic system faults → E. Issues with refrigerant flow, thermostat, or electrical problems

Unit 3 Theory Questions

1. What is the process for charging a refrigeration system, and why is it important?

Answer: Charging a refrigeration system involves adding the correct amount of refrigerant to the system to ensure optimal performance. The process is typically done after the system has been evacuated of air and moisture, using a vacuum pump. The correct amount of refrigerant is crucial to ensure the system can maintain the desired pressure and temperature levels. Overcharging or undercharging the system can lead to inefficient operation, compressor failure, or damage to components such as the expansion valve. Proper charging ensures the system runs smoothly and efficiently.

2. What is the function of the expansion valve (thermostatic) in a refrigeration system?

Answer: The thermostatic expansion valve (TXV) regulates the flow of refrigerant into the evaporator coil, controlling the amount of refrigerant based on the cooling load. It ensures that the refrigerant is expanded to the correct pressure and temperature, allowing it to absorb heat in the evaporator effectively. The valve works by sensing the temperature of the refrigerant leaving the evaporator and adjusting the flow rate to maintain a constant superheat, ensuring that no liquid refrigerant enters the compressor, which could cause damage.

3. What are some common problems with hermetic compressor motors, and how can they be diagnosed?

Answer: Common problems with hermetic compressor motors include electrical faults, such as short circuits, open windings, or damaged capacitors, and mechanical issues like overheating, bearing failure, or refrigerant contamination. Diagnosing these problems involves checking for electrical continuity, inspecting the capacitor for defects, measuring the compressor's resistance, and ensuring proper voltage and current supply. Overheating can be caused by inadequate ventilation, low refrigerant levels, or blocked air vents, and should be addressed by checking refrigerant charge and ensuring the compressor is clean and properly ventilated.

4. Why is servicing essential in refrigeration systems, and what does it typically involve?

Answer: Servicing is essential to maintain the efficiency, longevity, and safe operation of refrigeration systems. Regular servicing involves checking and cleaning components such as the evaporator, condenser, and compressor, as well as inspecting and replacing worn-out parts like belts, gaskets, and filters. It also includes checking the refrigerant charge, inspecting for leaks, cleaning coils, and ensuring proper airflow. Regular servicing can prevent major breakdowns, improve energy efficiency, and extend the lifespan of the equipment.

5. How should leaks be repaired in a refrigeration system?

Answer: Leaks in a refrigeration system should be repaired promptly to prevent refrigerant loss and ensure the system operates efficiently. The first step is to locate the leak using a leak detector or a soap solution. Once identified, the affected area (such as joints, valves, or fittings) should be cleaned and prepared for sealing. In some cases, the leak may be sealed with a specially designed epoxy or sealant, while in others, the defective component (such as a valve or connection) may need to be replaced. After repairs, the system should be evacuated to remove air and moisture, and then recharged with the correct amount of refrigerant.

6. What is the importance of sealed system connections in refrigeration systems?

Answer: Sealed system connections are crucial for maintaining the integrity and efficiency of a refrigeration system. These connections ensure that the refrigerant remains within the closed

loop of the system, preventing leaks and contamination. They are typically used in hermetically sealed systems where components like the compressor, condenser, and evaporator are enclosed within a single unit. Proper sealing of these connections is important to prevent refrigerant loss, maintain optimal pressure, and protect the system from external contaminants like air and moisture. Sealing issues can lead to reduced system efficiency and potential compressor failure.

Unit 4 Theory Questions

1. What could be the cause if a compressor motor fails to start?

Answer: If a compressor motor fails to start, the problem could be due to several factors. The most common cause is a fault in the electrical supply, such as a blown fuse, tripped circuit breaker, or incorrect voltage. Additionally, issues like faulty wiring, a defective start capacitor, or a malfunctioning relay can prevent the motor from starting. It's also possible that the motor itself has a mechanical fault, such as seized bearings, which can prevent it from turning on. Diagnosing this issue requires checking the electrical connections, ensuring proper voltage, and inspecting the motor components.

2. Why might a compressor motor try to start but fail to run?

Answer: A compressor motor that tries to start but fails to run is often due to issues with the start capacitor, relay, or overload protection. A faulty start capacitor may not provide the necessary torque to initiate the motor, while a malfunctioning relay can fail to engage the motor correctly. Overload protection devices, such as thermal overloads, can trip if the motor draws too much current, preventing it from running. To diagnose this issue, it's important to check the capacitor, relay, and overload protector for faults and ensure that the motor is not blocked or facing mechanical resistance.

3. What are the possible causes if a compressor motor starts but does not reach running speed?

Answer: If a compressor motor starts but fails to reach running speed, the most likely causes are low voltage, a faulty capacitor, or an issue with the compressor itself. Low voltage can result from insufficient power supply or issues in the electrical wiring, causing the motor to struggle to reach full speed. A worn or faulty capacitor may also fail to provide the necessary

starting torque. Additionally, mechanical resistance within the compressor, such as damaged bearings or a partially seized motor, can prevent the motor from reaching full speed. It is crucial to check the voltage, capacitor, and motor's mechanical components.

4. What types of thermostat failures are common in refrigeration systems?

Answer: Common thermostat failures in refrigeration systems can be either mechanical or electrical. Mechanical failures may include a broken or stuck sensing bulb, which prevents the thermostat from accurately reading temperature changes. Electrical failures may involve faulty wiring, a burned-out thermostat contact, or a malfunctioning relay that prevents the thermostat from turning the compressor on or off at the correct times. In some cases, the thermostat may also become miscalibrated, leading to temperature control issues. Diagnosing thermostat failure involves checking the temperature settings, inspecting wiring, and testing the device for continuity.

5. What causes pressure cut-out failure, and how can it be fixed?

Answer: Pressure cut-out failure occurs when the pressure switch that controls the system's cycling does not operate correctly. This can be caused by faulty pressure sensors, incorrect pressure settings, or a clogged filter-drier that leads to incorrect pressure readings. When the pressure cut-out fails, it can prevent the compressor from turning on or off at the correct times, leading to system inefficiency or failure. To fix this, the pressure switch should be inspected and calibrated, and any blockages in the refrigerant line should be removed. If the switch is faulty, it may need to be replaced.

6. How can wiring and connection faults be identified in a refrigeration system?

Answer: Wiring and connection faults in a refrigeration system can be identified through visual inspection and electrical testing. Common issues include loose connections, damaged or frayed wires, or corroded terminals that may cause intermittent electrical contact or short circuits. A multimeter can be used to check for continuity in the wiring, ensuring there are no open circuits or faults. Additionally, inspecting the connections for signs of wear, such as burns or discoloration, can help locate the source of the problem. Repairing these faults typically involves re-tightening or replacing faulty wiring and connections to ensure proper electrical flow.

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SUBJECT: RAC Maintenance - II SEM I

Unit 5 Theory Questions

1. How is fault analysis by temperature and pressure used in refrigeration systems?

Answer: Fault analysis by temperature and pressure is a common diagnostic method in refrigeration systems. By measuring the temperature and pressure at various points in the system (such as the evaporator, condenser, and compressor), technicians can identify issues like undercharging or overcharging of refrigerant, blockages, or improper system operation. For instance, if the evaporator temperature is too high or too low compared to the expected values, it may indicate insufficient refrigerant or a problem with the expansion valve. Similarly, abnormal pressure readings can help pinpoint issues like compressor malfunction, clogged filters, or refrigerant leaks.

2. What are the common methods of confirming a fault in a refrigeration system?

Answer: Common methods of confirming a fault in a refrigeration system include visual inspections, pressure-temperature checks, and using diagnostic tools like multimeters, manometers, or leak detectors. Visual inspection can reveal signs of refrigerant leaks, damaged components, or dirty coils. Pressure-temperature readings help confirm refrigerant charge and flow issues. If a compressor is malfunctioning, measuring the voltage and current can help identify electrical issues, while mechanical problems (like seized bearings) may require disassembling the compressor for inspection. Technicians may also use specialized equipment, such as ultrasonic leak detectors, to pinpoint hard-to-find faults.

3. What should be checked when the compressor is not running?

Answer: When the compressor is not running, the first things to check are the power supply and electrical components. Verify if the compressor is receiving the correct voltage and if the circuit breaker or fuse is functioning properly. Next, check the start capacitor and relay, as a malfunction here can prevent the compressor from starting. Inspect the thermostat and pressure cut-out switches to ensure they are operating correctly. If the electrical components are intact, it’s essential to check the compressor’s internal mechanisms for issues such as a seized motor or damage to the compressor’s mechanical parts, which may require a professional diagnosis.

4. What could cause abnormal noise in a refrigeration system, and how is it diagnosed?

Answer: Abnormal noise in a refrigeration system can be caused by a variety of issues. Common sources of noise include loose or damaged components, such as fan blades, bearings, or compressor parts. A rattling or buzzing noise might indicate a loose or vibrating part, while a grinding or squealing noise can suggest worn-out bearings or a malfunctioning compressor. To diagnose the problem, listen carefully to the type of noise to determine its source. Check for loose parts or debris in the fan or motor. If the noise is coming from the compressor, it may be due to internal damage, requiring further inspection or even replacement of the compressor.

5. What are some typical faults that occur in domestic refrigeration systems?

Answer: Common faults in domestic refrigeration systems include problems with the thermostat, compressor, evaporator, and condenser. A faulty thermostat can cause temperature regulation issues, while a malfunctioning compressor may fail to circulate refrigerant properly, leading to inadequate cooling. Dirty or blocked evaporator and condenser coils can reduce the system's efficiency, causing the refrigerator to work harder and overheat. Additionally, refrigerant leaks can lead to insufficient cooling. Other faults can include electrical issues such as broken wiring or tripped circuit breakers. Regular servicing and maintenance can help prevent these common problems from affecting the system's performance.