

SIR ARTHUR LEWIS COMMUNITY COLLEGE
ENGINEERING AND THE CIRCULAR ECONOMY
ACADEMIC YEAR (2024/2025) - SEMESTER ONE
END OF SEMESTER EXAMINATION

TUTOR (S)	:	Mr. Percival Beausoleil
PROGRAMME	:	Refrigeration and Air Conditioning –Part Two
COURSE TITLE	:	Refrigeration Technology
COURSE CODE	:	RAC105
LEVEL	:	Certificate/Year Two
PAPER	:	One
DATE	:	Friday, 20th December 2024
COMMENCEMENT TIME	:	1:00 p.m.
DURATION	:	2 hours
INVIGILATOR (S)	:	M-L. Felix, E. Hunte, E. Hunte, D. Jn. Baptiste, Z. John
ROOM (S)	:	CEH-1R-02

GENERAL INFORMATION AND INSTRUCTIONS

- **This paper consists of Three (3) Sections.** You are required to **answer all questions** on the answer sheet provided.
- **Section A** consists of Fifty (50) Multiple Choice Questions. One mark will be awarded for each correct answer.
- **Section B** consist of Five (5) Short Answer Questions. Four marks are awarded for each correct answer.
- **Section C** consist of Ten (10) Fill in the Blanks Questions. One mark will be awarded for each correct answer.
- Students must sign **IN** and **OUT** on the examination class list.
- Students must **not** write their names on their answer sheets, only their ID number.
- Please number your responses accordingly.
- Calculators are allowed.
- **Note: Bags, Books as well as writing paper not given by the invigilator should be deposited at the front of the examination room or as otherwise indicated.**
- **All cell phones must be turned off during the exam.**

**DO NOT TURN THIS COVER SHEET UNTIL
YOU ARE TOLD TO DO SO!!!**

SECTION A: Multiple Choice Questions

Answer all questions. (One mark will be awarded for each correct answer)

1. The bulb of the TXV is mounted on the
 - A. compressor inlet.
 - B. compressor outlet.
 - C. evaporator inlet.
 - D. evaporator outlet.
2. The low water cut off is a _____
 - A. normally closed switch that opens on a rise in water level
 - B. normally closed switch that opens on a drop in water level
 - C. normally open switch that closes on a rise in water level
 - D. normally open switch that closes on a drop in water level
3. Refrigerant in the evaporator
 - A. changes from vapor to liquid.
 - B. changes from liquid to vapor.
 - C. stays in the vapor state.
 - D. stays in the liquid state.
4. On which of the following is a water cut off found _____
 - A. hydronic system
 - B. hot water system
 - C. steam system
 - D. all of the above
5. When an evaporator experiences a heat-load increase, the suction pressure
 - A. remains constant.
 - B. decreases.
 - C. varies up and down.
 - D. increases.
6. A high efficiency air-conditioning system operating with an outside temperature of 95 degrees will have a condenser saturation temperature of about -----degrees:
 - A. 100
 - B. 105
 - C. 115
 - D. 125
7. What would be considered a higher-than-normal temperature for a discharge gas line on a reciprocating compressor?
 - A. 190°F
 - B. 215°F
 - C. 250°F
 - D. All of the above.
8. Subcooled refrigerants is always at a temperature that_____ saturation temperature:
 - A. Lower than the condenser
 - B. higher than the condenser
 - C. Lower than the evaporator
 - D. Higher than the evaporator
9. Which of the following is true regarding the evaporator pressure and temperature?
 - A. If the system load is high, the evaporator temperature will increase and the evaporator pressure will decrease.
 - B. If the system load is low, the evaporator temperature will increase and the evaporator pressure will decrease
 - C. If the system load is high, the evaporator temperature and pressure will both increase
 - D. If the system load is high, the evaporator temperature and pressure will both decrease
10. How much airflow is typically required by air conditioning systems?
 - A. 300 CFM/Ton
 - B. 350 CFM/Ton
 - C. 400 CFM/Ton
 - D. 450 CFM/Ton

11. What lubricates the refrigeration compressor?
 - A. Refrigerant
 - B. Moisture
 - C. Desiccants
 - D. Oil

12. If the evaporator temperature is below 32°F, there must be some provision for:
 - A. Defrost.
 - B. Adding refrigerant.
 - C. Increasing in the rate of vaporization
 - D. Flooding the evaporator

13. When an evaporator experiences a heat-load increase, the suction pressure
 - A. remains constant.
 - B. decreases.
 - C. varies up and down.
 - D. increases.

14. A medium-temperature refrigeration box operates within what temperature range?
 - A. 28°F to 40°F
 - B. 40°F to 60°F
 - C. 0°F to -20°F
 - D. 0°F to 50°F

15. Chemicals in water are removed by:
 - A. Sanitization
 - B. Cleaning
 - C. Carbon Filtration
 - D. Reverse osmosis

16. Fluid expansion controls operates on the concept that as a fluid in a sealed vessel _____
 - A. is heated, the pressure in the vessel will decrease.
 - B. is cooled, the pressure in the vessel will increase.
 - C. is heated, the pressure in the vessel will increase.
 - D. both A and B

17. Bimetal strips are most likely to be found on _____
 - A. thermostats with mercury –filled bulbs.
 - B. electronic thermostats.
 - C. high pressure controls.
 - D. low pressure controls.

18. The high- pressure control _____
 - A. open on an increase in head pressure
 - B. closes on an increase in head pressure
 - C. open on an increase in suction pressure.
 - D. closes on an increase in suction pressure

19. The low- pressure control is located _____
 - A. in the suction line between the evaporator and the compressor.
 - B. at the outlet of the condenser
 - C. at the outlet of the compressor.
 - D. at the inlet of the metering device.

20. In the fluid expansion type control, as the sensing bulb is heated _____
 - A. the pressure in the bulb decreases to energize or de-energize electric circuits
 - B. the pressure in the bulb increases to energize or de-energize electric circuits
 - C. the metal strip will warp to open electric contacts.
 - D. the metal strip will warp to close electric contacts.

21. Which of the following best describes a heating thermostat
- a device that closes its contacts when the temperature changes from 75 degrees to 65 degrees.
 - a device that closes its contacts when the temperature changes from 65 degrees to 75 degree
 - a device that opens its contacts when the temperature changes from 75 degrees to 65 degree
 - both A and B
22. Thermostats that contains mercury bulbs _____
- have these bulb connected to bimetal strips.
 - must be mounted perfectly level to ensure that the proper space temperature is maintained.
 - both A and B
 - neither A and B
23. The high –pressure switch is typically connected to the _____
- suction side of the refrigeration system and is most often an automatic reset device
 - discharge side of the refrigeration system and is most often an automatic reset device
 - suction side of the refrigeration system most often, must be manually reset
 - discharge side of the refrigeration system most often, must be manually reset
24. The operation of a electric motor relies on the fundamental concept of _____
- magnetism.
 - electricity
 - physics
 - chemistry
25. The number of poles which a motor is manufactured will determine the -----of the motor.
- starting torque.
 - speed
 - size
 - voltage
26. The twisting force that is used to start a motor is referred to as _____
- electromotive force
 - starting torque
 - power
 - voltage.
27. The device that open and closes its contact depending on the speed of the motor is the _____
- current relay
 - potential relay
 - centrifugal switch
 - Positive temperature coefficient (PTC) relay
28. The purpose of the start capacitor is to _____ of the motor.
- increase the starting torque
 - increase the running efficiency
 - both A and B
 - neither A and B
29. Which of the following is true regarding the shaded pole motor?
- the motor has a high resistance run winding and a low –resistance start winding.
 - the motor is typically used to turn small fan blades connected directly to the shaft of the motor.
 - the motor uses both a run capacitor and a start capacitor
 - all of the above are correct.

30. Which of the following is true regarding the run capacitor?
- it is intended to be in the active circuit whenever the motor is energized.
 - it is considered to be a “wet” capacitor
 - it is encased in a metal shell
 - all of the above are correct.
31. Start capacitors _____
- remains in the circuit whenever the motor is running.
 - can be removed from the circuit with a current relay
 - is in the active circuit whenever the run capacitor is in the active circuit
 - both B and C
32. Capacitors can be used _____
- to increase the starting torque of the motor
 - increase the running efficiency of the motor
 - as an electron storage device.
 - all of the above.
33. A refrigeration system that operates with a box temperature in the range from 33 to 40 degrees is classified as a _____
- high-temperature refrigeration system.
 - medium-temperature refrigeration system.
 - low-temperature refrigeration system.
 - ultra-low-temperature refrigeration system.
34. Forced draft evaporators use _____
- natural convection currents to force air through the evaporator coil
 - fans and blowers to pull air through the evaporator coil.
 - fans and blowers to push air through the evaporator coil.
 - both B and C
35. For an R-134 refrigeration system that maintains a box temperature of 0 degrees, the coil is at a temperature of about _____
- 0 degrees and the evaporator pressure is about 6.5 psig.
 - 15 degrees and the evaporator pressure is about 0 psig
 - 35 degrees and the evaporator pressure is about 12.4 “Hg.
 - 20 degrees and the evaporator pressure is about 18.4 psig.
36. In a shell and tube condenser, the water is piped in the _____
- shell of the condenser and hot gas from the compressor is piped through the tubes.
 - tubes of the condenser and hot gas from the compressor is piped into the shell.
 - shell of the condenser and the suction gas from the compressor is piped through the tubes.
 - tubes of the condenser and the suction gas from the compressor is piped into the shell.
37. The function of the automatic expansion valve is to maintain _____.
- constant evaporator pressure.
 - constant evaporator superheat.
 - constant sub cooling.
 - constant discharge pressure.
38. A refrigeration system that operates with a box temperature in the range from 47 to 60 degrees is classified as a _____
- high-temperature refrigeration system.
 - medium-temperature refrigeration system.
 - low-temperature refrigeration system.
 - ultra-low-temperature refrigeration system.
39. Mechanical draft evaporators
- use blowers to move air across the evaporator coil and are large compared to natural draft evaporators
 - use blowers to move air across the evaporator coil and are small compared to natural draft evaporators.
 - use natural convection current to move air across the evaporator
 - are typically of the stamped plate variety

40. For an R-134 refrigeration system that maintains a box temperature of 35 degrees, the coil is at a temperature of about _____
- 20 degrees and the evaporator pressure is about 18.4 psig.
 - 35 degrees and the evaporator pressure is about 18.4 psig.
 - 30 degrees and the evaporator pressure is about 43 psig
 - 35 degrees and the evaporator pressure is about 61.5 psig.
41. When electric strip heaters are used to defrost a low- temperature evaporator, the heaters are energized the evaporator fan motor _____
- remains operating and compressor remains on.
 - remains operating and compressor cycles off.
 - cycles off and compressor remains on.
 - cycles off and compressor cycles off.
42. The refrigerant and water flow in opposite directions in which type of condenser?
- mechanical draft condensers
 - tube –in tube condenser.
 - shell and tube condenser
 - shell and coil condenser.
43. Which of the following best describes the operation of the thermostatic expansion valve?
- the spring and bulb pressures push to open the valve and the evaporator pressure pushes the valve closed.
 - the spring and evaporator pressures push to close the valve and the bulb pressure pushes the valve open.
 - the spring and evaporator pressures push to open the valve and the bulb pressure pushes the valve closed
 - the bulb and evaporator pressures push to open the valve and the spring pressure pushes the valve close
44. One multi-evaporator system, evaporator pressure regulators are installed at the _____
- outlet of all evaporators.
 - inlet of all evaporators
 - outlet of all evaporators, with exception of the lowest temperature evaporator
 - outlet of all evaporators, with exception of the highest temperature evaporator
45. The accumulator is located in the _____
- suction line
 - liquid line.
 - expansion line.
 - discharge line
46. When multiple compressors are connected in parallel, _____
- the electrical failure of one compressor will cause the entire system to shut down.
 - all of the compressors cycle on and off together
 - the system can easily match the heat load on the system
 - all of the above
47. The purpose of the crankcase pressure regulator is to ensure that _____
- the evaporator pressure is maintained at the desired level.
 - the suction pressure at the inlet of the compressor is kept above a predetermined set point
 - the evaporator pressure is maintained below a predetermined set point.
 - the compressor is not exposed to excessively high pressures from the suction line.
48. The typical difference between the box and coil temperature on a low_ temperature refrigeration system is _____degrees
- 5 to 10.
 - 15 to 20
 - 25 to 35
 - 40 to 45

49. Recirculating water system typically require _____
 A. the use of water regulating valve that closes on a rise in head pressure.
 B. the use of water regulating valve that closes on a rise in head pressure.
 C. a cooling tower that supplies 85 degree water to the condenser
 D. a water flow of 1.5 gpm per ton of refrigeration.
50. As the required humidity level in a refrigeration box increases, _____
 A. the coil-to – air temperature difference will increase.
 B. the coil-to – air temperature difference will decrease.
 C. the box temperature will increase.
 D. the box temperature will decrease

SECTION B: Short Answer Questions.

Answer all questions. (Four marks will be awarded for each correct answer)

1. How can a restriction occur in an expansion valve? (4marks)
2. What do high discharge gas temperature do to the oil in the compressor? (4marks)
3. What does the compressor amperage do when the head pressure rises? (4marks)
4. What would the symptoms be if a condenser had two fan and one stopped running? (4marks)
5. What is the purpose of a crankcase heater on a compressor? (4marks)
- Total (20 Marks)**

SECTION C: Fill in the Blanks. Answer all questions.

(One mark will be awarded for each correct answer)

1. The heat that is added to a vapor after all of the liquid has boiled away is referred to as _____.
2. The _____ of the air passing over the evaporator has the greatest effect on the film factor.
3. Refrigeration designed for the purpose of storing flowers or candy is considered _____.
4. When a standard-efficiency air-cooled condenser is used, the condensing refrigerant will normally be _____ °F higher in temperature than the entering air temperature.
5. A direct expansion –type evaporator is also called a _____.
6. What is the maximum discharge line temperature recommended by most manufactures? _____F
6. Overheated oil may turn to carbon and create _____ in the system.
8. What would be the normal discharge line temperature for a unit while operating normally? _____F
9. The accumulator is located in the _____.
10. Recalculated air causes high _____ because the air is warmer.

Total (10 Marks)

END OF EXAMINATION!!!