higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

REFRIGERATION AND AIR CONDITIONING PROCESSES
NQF LEVEL 4

(6030054)

22 November 2018 (Y-Paper)
13:00–16:00

This question paper consists of 6 pages.

NCV

TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Write neatly and legibly.

Copyright reserved

QUESTION 1

1.1 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'True' or 'False' next to the question number (1.1.1–1.1.10) in the ANSWER BOOK.

1.1.1 Total heat is the sum of sensible heat and evaporative heat.

1.1.2 Specific volume is measured in kilogram per cubic meter.

1.1.3 Latent heat is measured in watts.

1.1.4 The heat of compression is given by h_2-h_1.

1.1.5 The amount of moisture to be added to the outside air is taken in by air conditioning.

1.1.6 1 kg of water equals 1ℓ of water.

1.1.7 Dehumidification can be done by cooling the air to below its dew point.

1.1.8 Water can be used as a cooling medium in the condenser.

1.1.9 Water may be used as a secondary refrigerant in a cooling system.

1.1.10 Saturated steam is cold steam.

(10 × 1) (10)

1.2 Name the THREE regions that are found on a pH chart. (3)

1.3 Explain how condensation of superheated vapour can be accomplished by lowering the pressure? (3)

1.4 Define the following terms:

1.4.1 Critical temperature (2)

1.4.2 Critical point (2)

[20]

NCV

QUESTION 2

2.1 Air at 21 °C dry bulb 15 °C wet bulb is heated by 20 °C dry. The air flow rate is 1,5 m^3/s and the barometric pressure is 84,6 kPa.

Calculate the following:

2.1.1 The heating load on the coil. (8)

2.1.2 Define *adiabatic process*. (2)

2.2 Name the section of a condenser where sub-cooling may take place. (2)

2.3 At which section of the refrigerant piping do we measure superheat? (2)

2.4 At what temperature setting will evaporator defrost start? (1)

2.5 What happens when the service valve is back-seated? (2)

2.6 The room temperature of an occupied space is too high. Explain with your own words what effect it will have on the refrigeration system. (3)

[20]

QUESTION 3

3.1 FIGURE 1 shows connections for drawing a vacuum.

Name the components by writing the answer next to the letter (A–D) in the ANSWER BOOK.

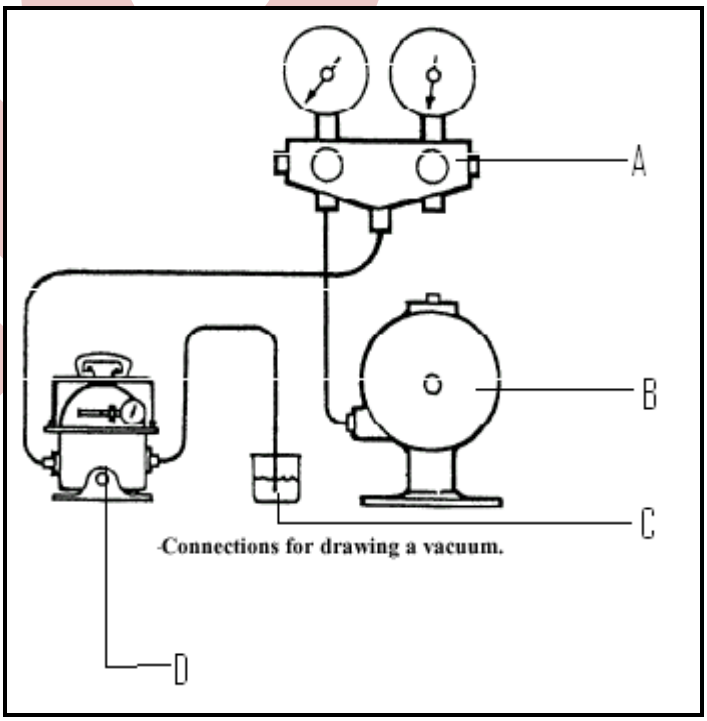


FIGURE 1

(4 × 1) (4)

3.2 Name the instrument used to measure the quantity of moisture in the air. (1)

3.3 Explain the difference between automatic reset controls and manual reset controls in a refrigeration system. (4)

3.4 Explain the practical application of a control system as applicable in a refrigeration system. (5)

3.5 Explain THREE factors taken in combination that can be used to accelerate the cooling effect when using water as a cooling medium. (3 × 2) (6)

[20]

QUESTION 4

4.1 FIGURE 2 shows a control diagram of an air conditioning system. Answer the questions that follow based on the diagram when the power is on and the system is on automatic.

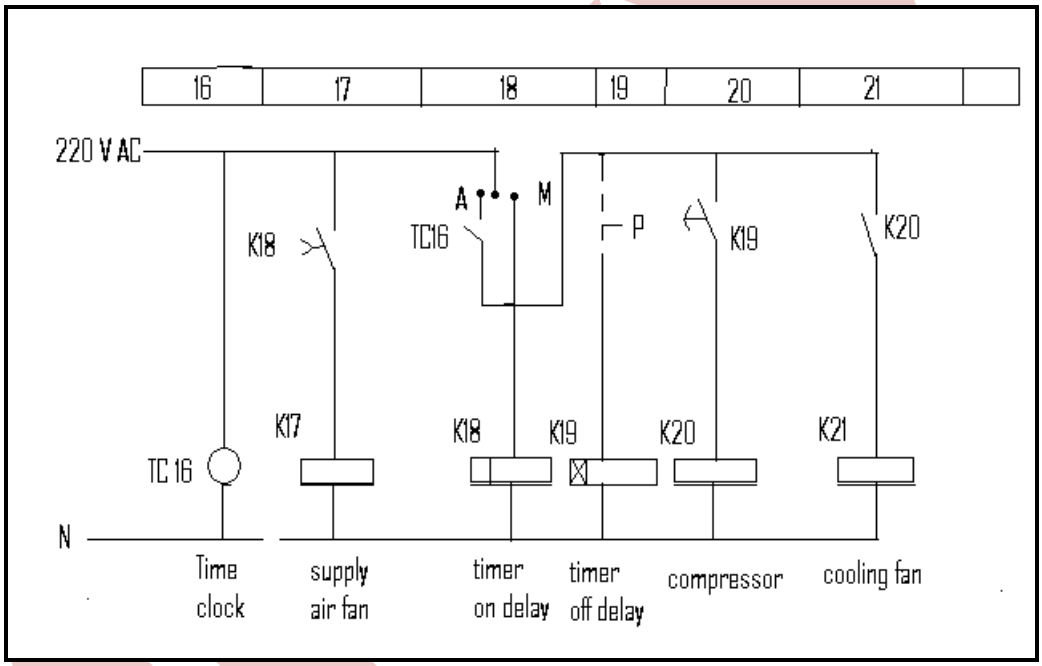


FIGURE 2

4.1.1 Which relay will be energised first? (1)

4.1.2 When will relay K19 be energised? (2)

4.1.3 Which relay and contact will start the cooling fan? (2)

4.1.4 If the system is switched off, what will happen to the supply air fan? (2)

4.1.5 Explain the operation of contact K19. (2)

Copyright reserved

4.2 Draw a control diagram for a part wind motor starter and show the following on your diagram:

A – Circuit breaker Q1 (1)
B – Overload protection F2 (1)
C – Overload protection F3 (1)
D – Off switch and on switch (2)
E – Relay KM1 and contact (2)
F – Relay KM2 and contact (2)
G – Delay on relay and contact (2)
[20]

QUESTION 5

5.1 Define *isothermal process.* (2)

5.2 Explain the consequences of inadequate maintenance on an air conditioning and refrigeration system. (2)

5.3 As a refrigeration mechanic you got a call from the plant operator as he realised that the compressor on the plant runs, but short cycles on overload protector.

5.3.1 Before you attend the problem, you need the service manual of that plant.

State THREE reasons why it is important for you to have access to the service manual. (3)

5.3.2 List THREE possible causes contributing to the above mentioned problem. (3)

5.3.3 Give THREE remedies for the above mentioned problem. (3)

5.3.4 List THREE tools that a technician will take along for servicing and repair of an air conditioning and refrigeration system. (3)

5.4 Name FOUR types of faults that might exist on a plant, before conducting fault-finding. (4)
[20]

TOTAL: 100

Copyright reserved