

## **AIR-CONDITIONING AND REFRIGERATION**

### **EXAMINATION SCHEME**

There will be three papers, Papers 1, 2 and 3, all of which must be taken. Papers 1 and 2 shall be a composite paper to be taken at one sitting.

PAPER 1: will consist of forty multiple-choice objective questions all of which are to be answered in 1 hour for 40 marks.

PAPER 2: will consist of five essay questions. Candidates will be required to answer any four in 1½ hours for 60 marks.

PAPER 3: will be a practical test of 2 hour duration. It will consist of two compulsory questions for 100 marks.

A list of materials shall be made available to the schools not less than two weeks before the paper is taken for material procurement and relevant preparation. Candidates will be expected to report at the examination venue to carry out the task in the presence of the examiner.

### **ALTERNATIVE TO PRACTICAL TEST**

The Council may consider testing candidates' ability in practical work as prescribed in the syllabus in the event that materials for the actual practical test cannot be acquired. For this alternative test, there will be two compulsory sets of written questions to be answered in 2 hours for 100 marks.

### **SAMPLE QUESTIONS**

#### **PAPER 1** **(OBJECTIVE)**

1. Which of the following is **NOT** a property of an ideal refrigerant?
  - A. High specific heat
  - B. Stability in complete cycle
  - C. Large latent heat of vaporization
  - D. High critical temperature

2. Wet bulb depression comes to zero when the air is fully
- A. saturated.
  - B. wet.
  - C. dry.
  - D. vaporized.
3. Which of the following is **NOT** a component of a *vapour compression refrigeration system*?
- A. *Compressor*
  - B. *Evaporator*
  - C. *Absorber*
  - D. *Condenser*
4. The heat transfer during an adiabatic process is
- A. reversible.
  - B. irreversible.
  - C. zero.
  - D. normal.
5. The material used in the refrigeration drier to absorb the moisture is the
- A. *calcium chloride.*
  - B. *silica gel.*
  - C. *calcium sulphate.*
  - D. *sodium hydroxide.*
6. Heat absorption in refrigeration system takes place in the
- A. *condenser.*
  - B. *control.*
  - C. *compressor.*
  - D. *evaporator.*

7. A temperature of  $-40^{\circ}\text{F}$  on the celcius scale is
- A.  $-0^{\circ}\text{C}$ .
  - B.  $-38^{\circ}\text{C}$ .
  - C.  $-40^{\circ}\text{C}$ .
  - D.  $-50^{\circ}\text{C}$ .
8. The commonly used refrigerant in a domestic refrigerator is
- A. R – 717.
  - B. R – 764.
  - C. R – 600A.
  - D. R – 290A.
9. The expansion of the refrigerant in a domestic refrigerator takes place in the
- A. accumulator.
  - B. drier.
  - C. control.
  - D. stainer.
10. *Silica gel* is used to absorb moisture from refrigerant in the
- A. *compressor*.
  - B. *condenser*.
  - C. *drier*.
  - D. *evaporator*.

**PAPER 2**  
**(ESSAY)**

1. (a) List **three** types of refrigerant controls that are commonly used in refrigeration and air conditioning systems.  
(b) (i) Sketch a capillary tube control.  
(ii) State the application of the capillary tube control sketched in (b)(i).  
(c) State **three** sources of financing an air conditioning and refrigeration business costing 1.5 million naira.
2. (a) State **four** advantages an individual will have over partnering with another person in a business of refrigeration and air conditioning.  
(b) Sketch the *vapour compression refrigeration system*.  
(c) label any **three** parts of the sketch in (b).
3. (a) State **three** properties of a refrigerant.  
(b) List the cylinder colour code for **each** of the following:
  - (i) R – 134a;
  - (ii) R – 717;
  - (iii) R – 600wa.

**PAPER 3**  
**(PRACTICAL PROJECT)**

1. Using the material provided below, construct an evaporator suitable for 1/8 hp refrigerator
  - (a)  $\frac{1}{4}$  copper piper ( $\frac{1}{2}$  roll);
  - (b) aluminium flat plate 1200mm x 1000 mm x 16 mm;
  - (c) mallet;
  - (d) rivet gun;
  - (e) rivet pin;
  - (f) punch;
  - (g) bending spring;
  - (h) snip;
  - (i) steel.
  
2. Using appropriate tools and equipment produce the following joints by brazing T, V, B and K.