

ELECTRICITY OF REFRIGERATION 2
5305

CAMEROON GENERAL CERTIFICATE OF EDUCATION BOARD

Technical and Vocational Education Examination



JUNE 2020

INTERMEDIATE LEVEL

Subject Title	ELECTRICITY OF REFRIGERATION
Subject Code No.	5305
Paper No.	TWO

Duration: 3 hours

This paper has three parts:

ANSWER ONLY 5 Questions in PART 1 and ONLY 2 Exercises in Part 2. All questions carry equal marks.

*You are reminded of the necessity for good English and orderly presentation in your answers.
Where calculations are involved, show your working at each stage showing your answers.*

Turn Over

PART 1: TECHNOLOGY (5 MARKS)

1. Define the following terms
 - (a) Alternating current,
 - (b) Diode,
 2. Give two applications of the Joule effect. **1 Mark**
 3. How many types of cells exist? Name them. **1 Mark**
 4. Name two faults which may occur in a transformer. **1 Mark**
 5. Give two ways of connecting the windings of a three phase motor **1 Mark**
 6. Why do we connect capacitors in parallel in a D.C circuit **1 Mark**
 7. What is the function of a thermal relay? **1 Mark**
 8. What is the role of an end of defrost thermostat? **1 Mark**
-

PART 2: PROBLEM SOLVING (20 MARKS)

EXERCISE 1: ALTERNATING CURRENT (AC)

10Marks

The method of two watt meters is used to measure the power absorbed by an equilibrium machine. Knowing that the two watt meters read respectively $P_1 = 800\text{W}$ and $P_2 = 1200\text{W}$. Determine;

1. The absorbed active power. **2 Marks**
 2. The absorbed reactive power. **2 Marks**
 3. The apparent power **2 Marks**
 4. The power factor of the machine. **2 Marks**
 5. The intensity of current when the machine is connected in star and is supplied of a voltage of 230V at a frequency $f = 50\text{ Hz}$. **2 Marks**
-

EXERCISE 2: RCL CIRCUITS

10Marks

A series RCL AC circuit has the following components:

$$R = 20\Omega; L = 0.2\text{H}; C = 100\mu\text{F}.$$

The supply voltage $V_{\text{max}} = 100\text{V}; 60\text{Hz}$

Determine;

- a) The capacitive reactance **2 Marks**
 - b) The inductive reactance **2 Marks**
 - c) The impedance of the circuit **2 Marks**
 - d) The maximum current in the circuit and **1 Marks**
 - e) The voltage across the each component **3 Marks**
-

EXERCISE 3: CAPACITORS**10Marks**

An electric board has capacitances of $1\mu\text{F}$, $3\mu\text{F}$, $5\mu\text{F}$ and $6\mu\text{F}$ connected in parallel to a direct supply of 100V ; 60Hz .

Find:

- | | |
|---|----------------|
| a) The equivalent circuit capacitance | 2 Marks |
| b) The total charge | 2 Marks |
| c) The charge on each capacitor | 3 Marks |
| d) Deduce the voltage across each capacitors | 1 Mark |
| e) Determine the current flowing through the equivalent capacitance | 2 Marks |
-

PART 3: DIAGRAM (10 MARKS)

A negative temperature cold store meant for the preservation of frozen fish operates as follows and has the following electric components.

- A compressor motor ($380 - 400\text{V}$),
- A condenser fan motor ($380 - 400\text{V}$),
- An evaporator fan motor ($220\text{V} - 230\text{V}$),
- Defrost heaters (220V , 50HZ),
- A 3 phase fuse isolator
- Thermal relays for each motor

Refrigeration mode

A manual two position switch is used to put ON and OFF the system. The compressor, the condenser and the evaporator fans work simultaneously. When the preset temperature is reached inside the cabinet, a thermostat opens its contacts and puts off the compressor and condenser fan. To prevent any migration of refrigerant from one side to the other side of the system, a solenoid valve is mounted in the liquid line as close as possible to the thermostat expansion valve.

Defrosting

Defrosting is ensured by heating elements connected on the evaporator coil and controlled by a timer and an end of defrosting thermostat.

Miscellaneous information

Each time the door is opened, the evaporator fan stops running. All power equipments are protected by thermal relays.

WORK REQUIRED

- 1- Propose a power diagram for this installation. **(10mks)**