

**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

FACULTY OF HEALTH, APPLIED SCIENCES AND NATURAL RESOURCES

DEPARTMENT OF NATURAL AND APPLIED SCIENCES

QUALIFICATION: BACHELOR OF SCIENCE	
QUALIFICATION CODE: 07BOSC	LEVEL: 6
COURSE CODE: EAM601S	COURSE NAME: ELECTRICITY AND MAGNETISM
SESSION: JUNE 2022	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
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INSTRUCTIONS
<ol style="list-style-type: none">1. Write all your answers in the answer booklet provided.2. Read the whole question before answering.3. Begin each question on a new page.

PERMISSIBLE MATERIALS

Scientific Calculator

THIS QUESTIONS PAPER CONSISTS OF 6 PAGES (Including this front page)

SECTION A

QUESTION 1

[30]

Short Answer Question Types: Each question in this section carries two marks

1.1 Positive charge is obtained when; (2)

- a. cellulose acetate is rubbed with silk b. polythene is rubbed with silk
c. ebonite rod is rubbed with fur d. glass rod is rubbed with fur

1.2 The electric field intensity is given by _____. (2)

- a. $\frac{Force}{Charge}$ b. $\frac{Charge}{Force}$ c. $Charge \times Force$ d. $\sqrt{Charge \times Force}$

1.3 Current is the rate at which charges move through (2)

- a. an insulator b. a conductor c. voltage d. ampere

1.4 Static electricity is produced due to; (2)

- a. friction b. conduction c. insulation d. both a and c

1.5 The S.I unit of electric field is; (2)

- a. Am^{-1} b. NC^{-1} c. Cm^{-1} d. Cm^{-2}

1.6 The instrument used in the measurement of voltage is; (2)

- a. voltmeter b. wheatstone bridge c. potentiometer D. ammeter

1.7 A work of 70 J is done in transferring 20 C of charge from a point B to a point A in an electric field. Calculate the potential difference between A and B. (2)

- a. 2.5 V b. 1.5 V c. 3.5 V d. 4.0 V

1.8 When a charge, q is released from rest in a uniform electric field, E set up between two (2)

oppositely charged plate with respect to vertical distance, y , what is the equivalent expression of the kinetic energy of the falling charge?

- a. $mv^2/2$ b. $2Ey$ c. qEy d. Eq

1.9 When an electron, e , is projected horizontally into a uniform electric field, E , with an initial velocity, V_0 , with an attraction towards positive charge at time, t , what is the value of the horizontal displacement? (2)

- a. eEt^2 b. at^2 c. V_0t d. eEt .

1.10 Capacitors have many applications in electrical circuit including the following except. (2)

- a. turning in radio circuit b. eliminating of spark in switches
c. rectification of coil in a transformer d. blocking noise in a.c. amplifiers

1.11 The parallel plates of an air-filled capacitor are everywhere 1.0 mm apart. What must the plate area be if the capacitor is to be 1.0 F? (2)

- a. $1.1 \times 10^8 \text{ m}^2$ b. $1.2 \times 10^8 \text{ m}^2$ c. $1.3 \times 10^8 \text{ m}^2$ d. $1.4 \times 10^8 \text{ m}^2$

1.12 The instrument used in the measurement of magnetic force is; (2)

- a. magnetic flux b. magnetometer c. magnetic filling d. iron filling

1.13 The ability of one coil to induce current in the nearby coil by the phenomenon of Induction when the current in the first coil changes is called _____. (2)

- a. self-induction b. electromagnetic induction c. mutual induction
d. inductance

1.14 An electrical device that convert converts mechanical energy into electric energy or vice versa is called _____. (2)

- a. converter b. dynamo c. motor d. generator.

1.15 The root mean square value of the voltage in an ac circuit is: (2)

- a. $0.637 V_{\max}$ b. $0.707 V_{\max}$ c. $2 V_{\max}$ d. $\sqrt{2} V_{\max}$

SECTION B

QUESTION 2

[15]

2.1 Define electrostatic.

(2)

2.2 List the two methods of charging the gold leaf electroscope.

(2)

2.3 State three examples of a field.

(6)

2.4 The concentration of charge on a conductor is such that its strength is $6\mu C$ and the surface area is $3\mu m^2$. What is its surface density?

(5)

QUESTION 3

[15]

3.1 Define electric resistance.

(2)

3.2 State three laws of resistances in series.

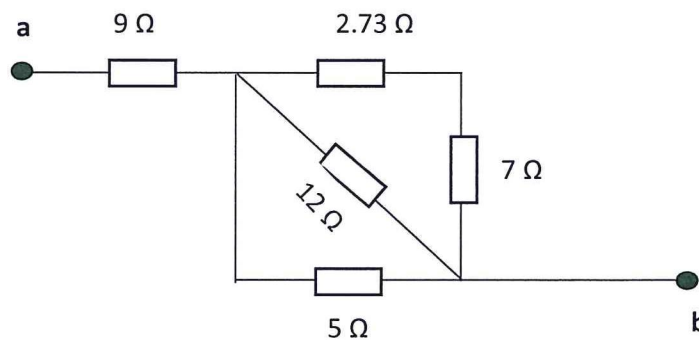
(3)

3.3 Write down the equation for the electric field due to a uniformly charged wire of length and define the various parameters.

(5)

3.4 In the figure below, find the resistance from point a to point b.

(5)



QUESTION 4**[15]**

- 4.1 Define electric potential difference. (2)
- 4.2 List three properties of electric field intensity. (3)
- 4.3 What do you understand by the term equipotential surface? (4)
- 4.4 In the Millikan experiment, an oil drop carries four electronic charges and has a mass of 1.8×10^{-12} g. It is held almost at rest between two horizontal charged plates 1.8 cm apart. What voltage must there be between the two charged plates? (Take electron charge $e = 1.60 \times 10^{-19}$ C) (6)

QUESTION 5**[15]**

- 5.1 State Lenz's law of electromagnetic induction. (2)
- 5.2 What did you understand by the term dynamo? (3)
- 5.3 Explain the term self-inductance. (3)
- 5.4 A coil of inductance 0.2 H and 1.0Ω resistance is connected to a 90 V source. (7)
- (i) At what rate will the current in the coil grow at the instant the coil is connected to the source?
- (ii) What is the current when it is growing at a rate of 100 A/S ?

QUESTION 6

[10]

6.1 Define the following terms:

(2)

(i) Inductive reactance

(ii) Capacitive reactance.

6.2 Draw an alternating circuit that involved a resistor, an inductor, and a capacitor connected in series with an ac source. What is the general name for the circuit?

(3)

6.3 The voltage output of a generator is given by $\Delta v = 200\sin\omega t$. Find

the rms current in the circuit when this generator is connected to a $100\ \Omega$ resistor.

(5)

END!