



**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

FACULTY OF HEALTH AND APPLIED SCIENCES

DEPARTMENT OF NATURAL AND APPLIED SCIENCES

QUALIFICATION: BACHELOR OF SCIENCE (MAJOR AND MINOR)	
QUALIFICATION CODE: 07BOSC	LEVEL: 6
COURSE CODE: EAM601S	COURSE NAME: ELECTRICITY AND MAGNETISM
SESSION: JUNE 2019	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 EXAMINATION QUESTION 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 Gold leaf electroscope consists of the following except. (2)

- a. Insulating plug b. Brass disc c. Earth metal case
- d. Constantan wire.

1.2 On a conductor, the greatest concentration of charges is at. (2)

- a. The conducting surface b. The insulating stand c. The sharpest point
- d. Inside the conductor.

1.3 The Concentration of charge on a conductor is such that its strength is $6\mu C$ and the surface area is $3\mu m$. What is its surface density? (2)

- a. $3.0 C/m$ b. $2.0 C/m$ c. $0.5 C/m$ d. $2.5 C/m$

1.4 The mathematical statement of coulomb's law is that (2)

- a. $F \propto \frac{q_1q_2}{r}$ b. $F = \frac{q_1q_2}{r^2}$ c. $F = \frac{q_1q_2}{4\pi\epsilon_0r}$ d. $F = \frac{q_1q_2}{4\pi\epsilon_0r^2}$

1.5 The following factors affect capacitors except (2)

- a. Separation, d between the capacitors b. Area of the capacitors
- c. Resistivity of the capacitors d. Nature of the separating medium.

1.6 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. $1.1 \times 10^8 m^2$ b. $1.2 \times 10^8 m^2$ c. $1.3 \times 10^8 m^2$ d. $1.4 \times 10^8 m^2$

1.7 A work of 30J is done in transferring 5 mC of charge from a point B to a point A in an electric field. Calculate the potential difference between A and B. (2)

- a. 60 V b. 6000 V c. 600 V d. 6 V

- 1.8 The instrument used in the measurement of current is (2)
a. Voltmeter b. Wheatstone bridge c. Potentiometer D. Ammeter
- 1.9 The space around a magnet where magnetic influence is felt is called _____. (2)
a. Magnetic field b. Magnetic strength c. Magnetic space
b. Magnetic region
- 1.10 Magnetic lines of force can be trace using one of the following (2)
a. Magnetic flux b. Magnetometer c. Magnetic filling d. Iron filling
- 1.11 Which of the following is a magnetic material (2)
a. Wood b. Iron c. Rubber d. Glass
- 1.12 All the followings are properties of magnetic lines of force except. (2)
a. Line of force do not intercept
b. Lines of force are imaginary lines
c. Lines of force are perpendicular to each other
d. Lines of force are uniformly spaced in a uniform magnetic field.
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- 1.13 All the followings are example of ferromagnetic substances except (2)
a. Iron b. Steel c. Nickel d. Aluminum
- 1.14 The S.I unit of magnetic flux density is (2)
a. Weber b. Tesla c. Henry d. Farad
- 1.15 The ability of one coil to induce current in the nearby coil by the phenomenon (2)
of induction when the current in the first coil changes is called
a. Self-induction b. Mutual induction c. Electromagnetic induction d. Induction.

SECTION B

QUESTION 2

[15]

2.1 State Coulomb's law of electrostatic. (2)

2.2 Define electric field intensity. (2)

2.3 What are the properties of electric field intensity? (3)

2.4 Calculate the electric force, F if (i) the separation between two electrons is 10^{-10} m, (8)

(ii) the separation between a proton and electron is 10^{-10} m (iii) comment on the results, assume free space medium. ($1e = -1.6 \times 10^{-19}$ C, $1p = +1.6 \times 10^{-19}$ C,

$$k = \frac{1}{4\pi\epsilon_0} = 9.0 \times 10^9 \text{).}$$

QUESTION 3

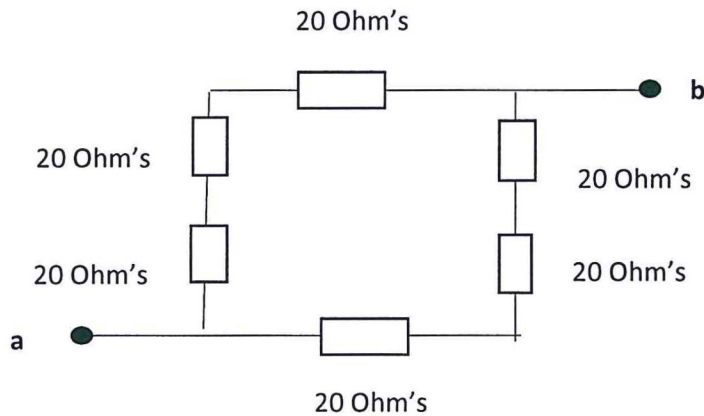
[15]

3.1 What did you understand by the term current electricity? (2)

3.2 Define the following term (i) Electromotive force (emf) (ii) Potential difference (p.d) (6)
(iii) Electric resistance.

3.3 State the factors affecting electrical resistance of a wire. (4)

3.4 In the figure below, find the resistance from point a to point b. (3)



QUESTION 4 [15]

4.1 Define the capacitance of a capacitor. (2)

4.2 State three factors on which the capacitance of a parallel plate capacitor depends. (3)

4.3 Derive a formula for the energy W stored in a charged capacitor of capacitance C carrying a charge Q on either plate. (3)

4.4 Two capacitors of capacitance $4 \mu F$ and $6 \mu F$ are connected in series to a 100V d.c supply. Draw the circuit diagram and calculate (i) Charge on either plate of each capacitor (ii) Potential difference across each capacitor (iii) Energy of the combined capacitors. (7)

QUESTION 5 [15]

5.1 What did you understand by the term magnetic flux density? (2)

5.2 Explain three ways of demagnetizing a magnet. (3)

5.3 What are the applications of Hall Effect? (3)

5.4 An electron is projected into a magnetic field of flux density 27 tesla with a velocity of 3.0×10^7 m/s in a direction at right angle to the field. Find the magnetic force experience by the electron. Take electron charge, $q = 1.60 \times 10^{-19}$ C. (7)

QUESTION 6

[10]

6.1 State Faraday's first laws of electromagnetic induction (2)

6.2 What are the factors that affect the strength of an induced current? (3)

6.3 Calculate the inductance of an air-core solenoid containing 300 turns if the length of the solenoid is 25.0 cm and its cross-sectional area is 4.00 cm^2 . (5)

END!