

Candidate's Examination Number.....

**THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
FORM TWO NATIONAL ASSESSMENT**

080

ELECTRICAL ENGINEERING

Time: 2:30 Hours

Tuesday, 21st November 2017 a.m.

Instructions

1. This paper consists of sections A and B with a total of **eleven (11)** questions.
2. Answer **all** questions in section A. In section B answer **all** questions in either part I or part II depending on the area of your specialization.
3. All answers must be written in the spaces provided.
4. All writings must be in blue or black ink **except** drawings which must be in pencil.
5. All communication devices and calculators are **not** allowed in the examination room.
6. Write your **Examination Number** at the top right corner of every page.

FOR EXAMINERS' USE ONLY		
QUESTION NUMBER	SCORE	EXAMINER'S INITIALS
1		
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10		
11		
TOTAL		



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SECTION A (50 Marks)

ELECTRICAL ENGINEERING SCIENCE

Answer all questions in this section.

1. For each of the items (i) – (x), choose the correct answer from the given alternatives and write its letter in the box provided.

- ✓ (i) What is the SI unit of electromotive force?

- A Faraday B Ampere
C Volt D Ohms

- ✓ (ii) A transformer having 1000 primary turns is connected to a 240 V supply with a secondary voltage of 400 V. What is the number of turns on secondary side?

- A 1600 B 250
C 400 D 1000.

- (iii) A cell of an open circuit has an e.m.f of 2.2 V and terminal voltage of 2.0 V. What is the internal resistance of a cell when the load current is 20 A?

- A 0.21Ω B 0.11Ω
C 0.1Ω D 0.01Ω .

- ✓ (iv) What is the frequency of a d.c power supply used in Tanzania?

- A 50 Hz B $60\sqrt{2}$ Hz
C 100 Hz D zero

- (v) When an atom either gains or losses an electron is said to be

- A bonded. B ionized.
C excited. D stabilized.

- (vi) Which of the following materials is the best conductor of electricity?

- A Cold water B Distilled water
C Warm water D Salt water

- (vii) The electrical network that does not have either voltage or current source is called

- A active network. B passive network.
C resistive network. D dummy network.

- (viii) The resistance of a material of 2 m long and 2 m^2 cross-sectional area is $1.6 \times 10^{-8} \Omega$. What is its temperature coefficient?

- A $3.2 \times 10^{-8} \Omega\text{-m}$ B $6.4 \times 10^{-8} \Omega\text{-m}$
C $1.6 \times 10^{-8} \Omega\text{-m}$ D $0.16 \times 10^{-8} \Omega\text{-m}$

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(ix) How do you connect an instrument when measuring a voltage across the load?

- A Voltmeter in series with the load
- B Ammeter across the load
- C Ammeter in parallel with the load
- D Voltmeter across the load

(x) According to Faraday's laws of electromagnetic induction, the e.m.f is induced in a conductor when a conductor

- A lies in a magnetic field.
- B moves parallel to the magnetic flux.
- C cuts the magnetic flux.
- D moves vertically to the magnetic flux.

2. (a) What is the difference between a battery and a cell?

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(b) What is the meaning of the following terms as used in cells and batteries?

(i) Electrolyte

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(ii) Anode

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(iii) Cathode

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3. State the instrument which is used to measure each of the following quantities:

- (a) Current
- (b) Resistance.....
- (c) Power
- (d) Energy

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(e) Voltage

4. Use the current divider theorem to calculate the values of current (I_1) and (I_2) in Figure 1.

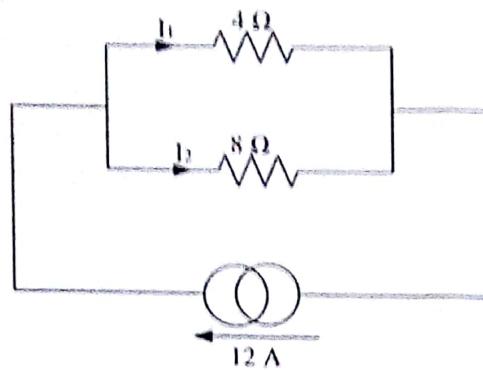


Figure 1

5. (a) Give two basic types of transformers.

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- (b) A transformer has 200 turns in primary winding and 600 turns in secondary winding. If the primary voltage is 120 V, find the secondary voltage.

6. (a) What is the difference between a conductor and a cable?

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- (b) Define the term resistance of a metallic material.

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- (c) State two factors on which the resistance of a metallic conductor depends.

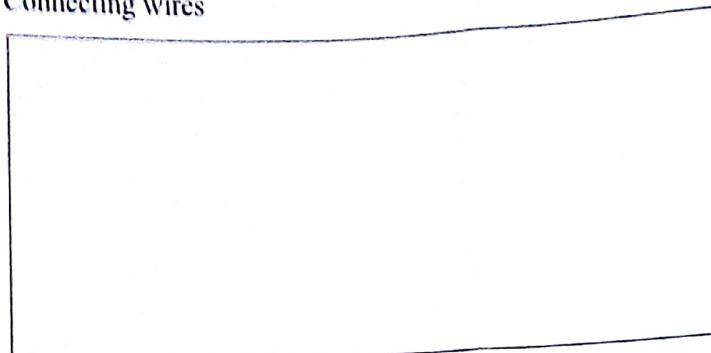
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7. Three capacitors with capacitances of $5 \mu\text{F}$, $10 \mu\text{F}$ and $15 \mu\text{F}$ are connected in series. Calculate the total capacitance.

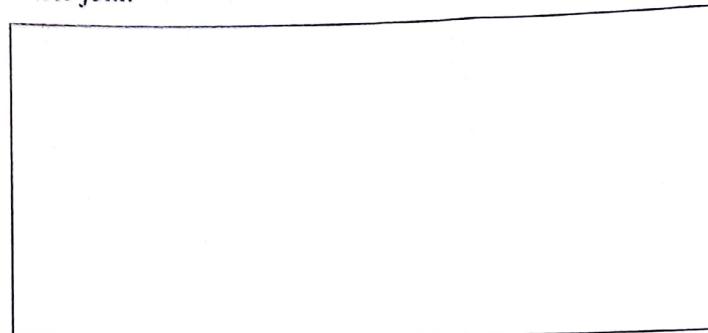
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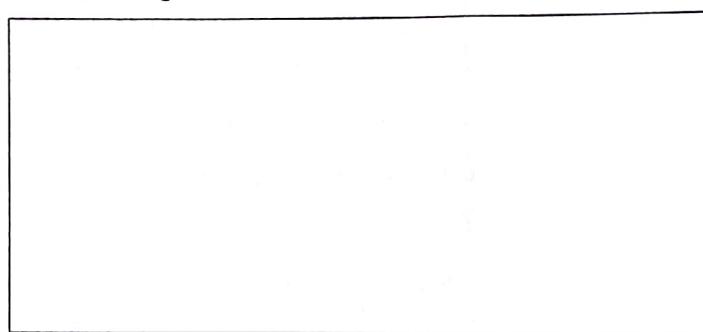
8. Draw the electrical symbol for each of the following:
- (a) Connecting wires



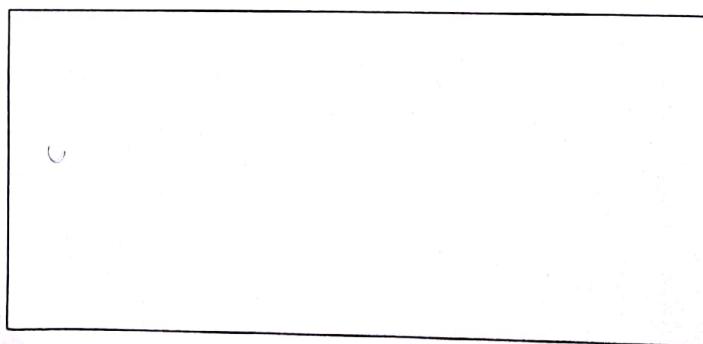
- (b) Wires joint



- (c) Wires crossing



- (d) Earth connection



(e) Cell

A large, empty rectangular frame with a thin black border, centered on a white background.

9. (a) State two factors which influence the force on current carrying conductor.

A piece of copper has a resistance of 10Ω at a temperature of 0°C . What will be its resistance at 50°C if its temperature coefficient is 0.004 ?

SECTION B (50 Marks)
PART I
ELECTRICAL INSTALLATION

10. (a) State the function of each of the following accessories:
(i) Intermediate switch

Two-way switch

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- (iii) Incandescent lamp

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(iv) Switch socket

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(v) Junction box

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(b)

 - (i) Name the standard voltage for a single phase supply system.
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 - (ii) Give the minimum and maximum voltage for single phase supply system.
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 - (iii) Name two types of power generation systems.
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 - (iv) List three possible electric faults that can occur in electrical circuits.
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(v) What is the meaning of the term "electrical energy"?

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(c) Define the following terms as used in electrical installations:

(i) Earth continuity conductor

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(ii) Earthing lead

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(iii) Direct earthing

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(iv) Earth electrode

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(v) Consumer's earthing terminal

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(d) (i) What is an ideal transformer?

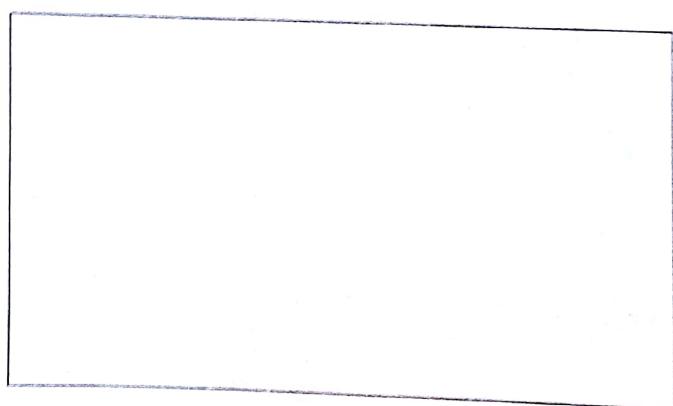
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- (ii) With regards to the principles of operations, give the difference between a single phase double wound transformer and a single phase auto-transformer.

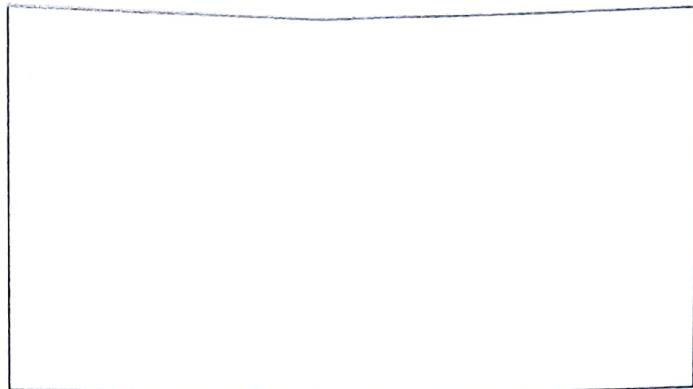
- (iii) Calculate the maximum value of flux in the core of a transformer having 2000 primary turns and supplied at 240 V, 50Hz.

- (e) Draw the electrical symbol which represents each of the following accessories:
(i) Two-way switch.

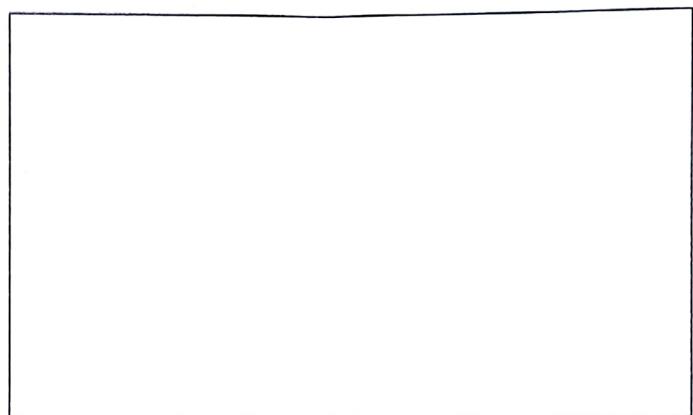


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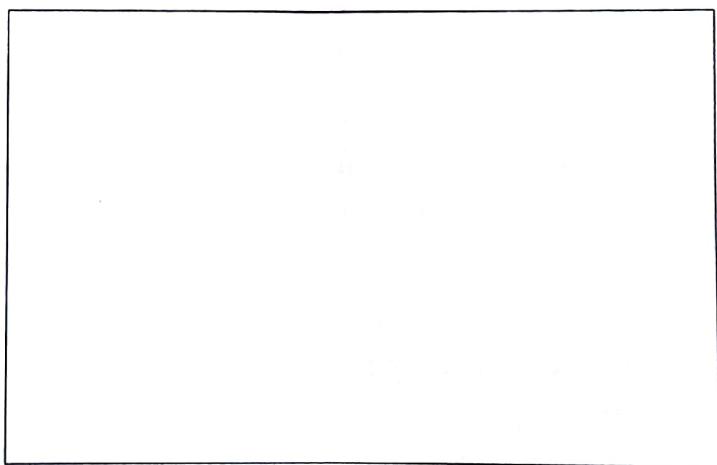
- (ii) Switch-socket.



- (iii) Cooker control unit.

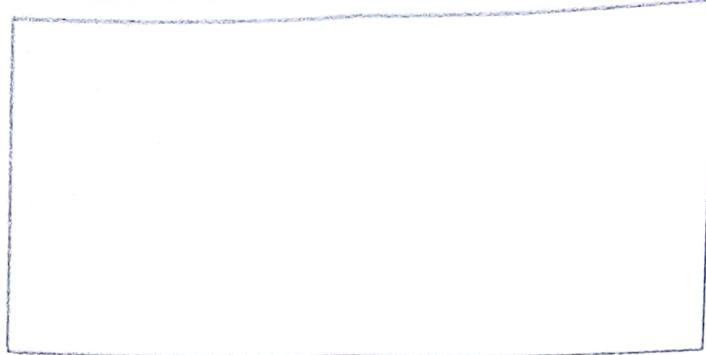


- (iv) Pull switch.



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- (v) Intermediate switch.



PART II
ELECTRONICS, RADIO AND TV SERVICING

Answer all questions in this part.

II.

- (a) (i) Mention three main causes of accidents in any electronics workshop.

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- (ii) Write two types of fire extinguishers used to put off an electric fire.

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- (iii) What is the main function of a resistor in electronic circuits?

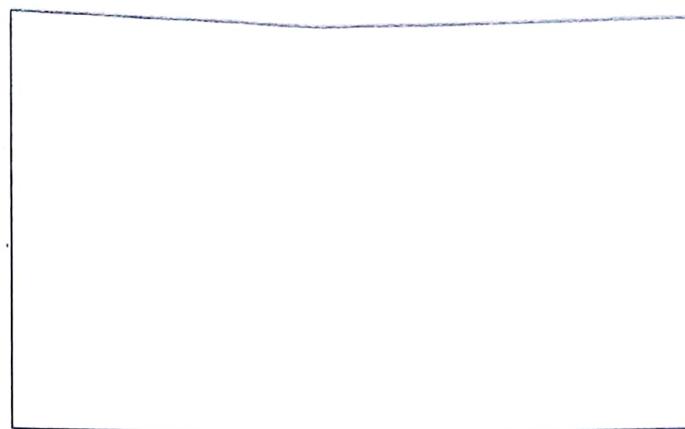
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- (iv) Give three necessary factors that must be considered when choosing a resistor.

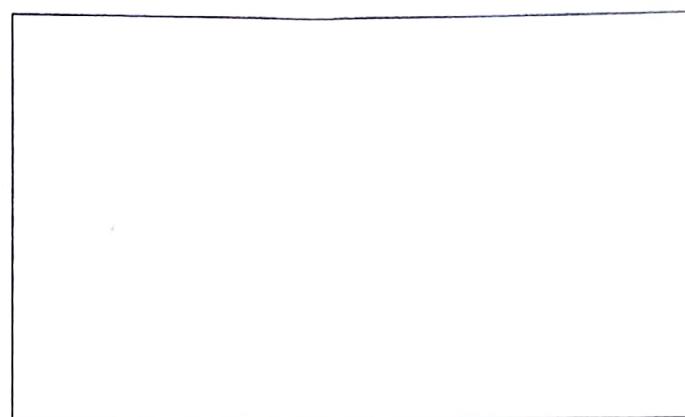
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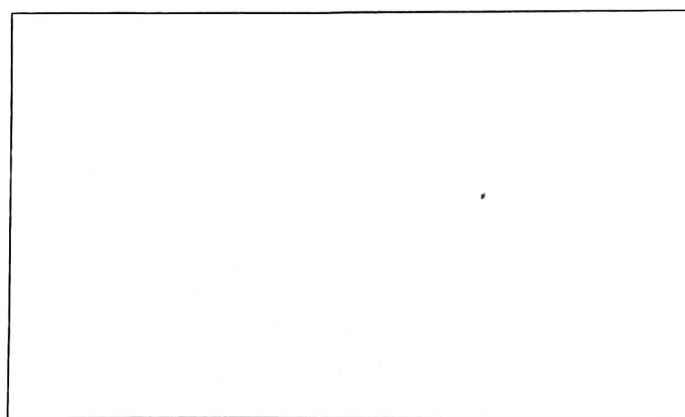
- (b) Draw electronic symbol for each of the following components:
- (i) Aerial



- (ii) Loudspeaker

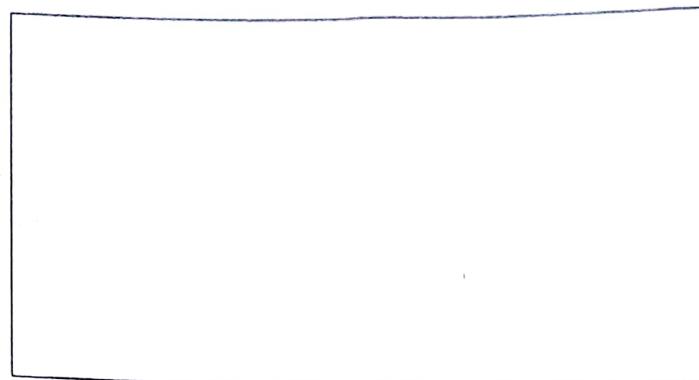


- (iii) Battery

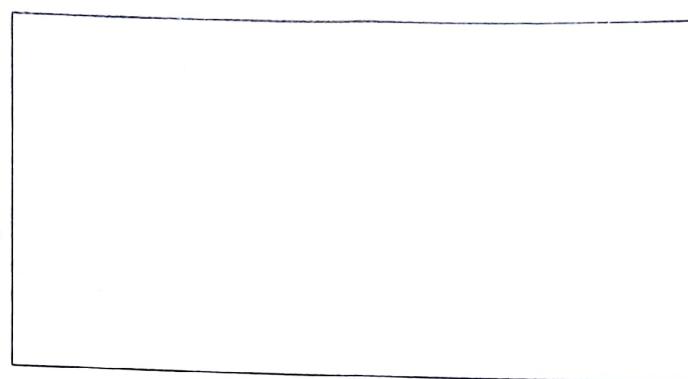


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(iv) Zener diode



(v) Fixed resistor



(c) (i) Define the term capacitance of a capacitor.

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(ii) Three capacitors $C_1 = 4\mu F$, $C_2 = 3 \mu F$ and $C_3 = 2 \mu F$ are connected in such a way that, C_1 and C_2 are connected in series and C_3 is connected in parallel to them. Calculate the overall capacitance.

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- (d) From the relation between α and β , show that $\beta = \frac{\alpha}{1-\alpha}$

- (e) (i) List three common types of transistor circuit configurations.

- (ii) If the maximum power dissipation of a transistor is 100 mW and the voltage across collector emitter is 25 V, what is the maximum collector current in milliampere?

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- (iii) Mention three methods used for biasing transistors.