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		
2		
3		
4		
5		
6		
7		
8		
9		
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 0.11 Ω
C 0.1Ω D 0.01 Ω.

(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 resisitive network. D dummy network.

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

A 3.2×10^{-8} Ω-m B 6.4×10^{-8} Ω-m
C 1.6×10^{-8} Ω-m D 0.16×10^{-8} Ω-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 .....

(e) Voltage .....

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

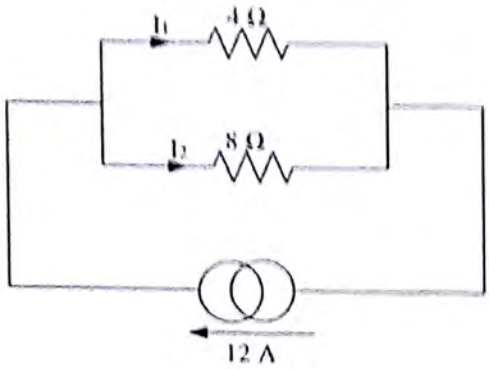

Figure 1

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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.

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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 μF, 10 μF and 15 μF are connected in series. Calculate the total capacitance.

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8. Draw the electrical symbol for each of the following:

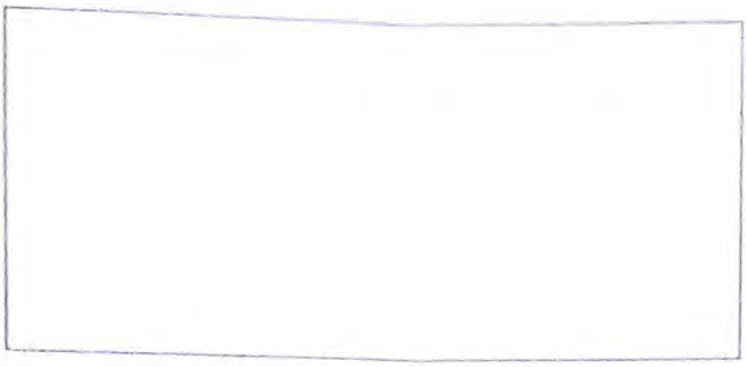
(a) Connecting wires

(b) Wires joint

(c) Wires crossing

(d) Earth connection

(e) Cell



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

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

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SECTION B (50 Marks)
PART I
ELECTRICAL INSTALLATION
Answer **all** questions in this part.

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

(i) Intermediate switch

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(ii) 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 installation:

(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.

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

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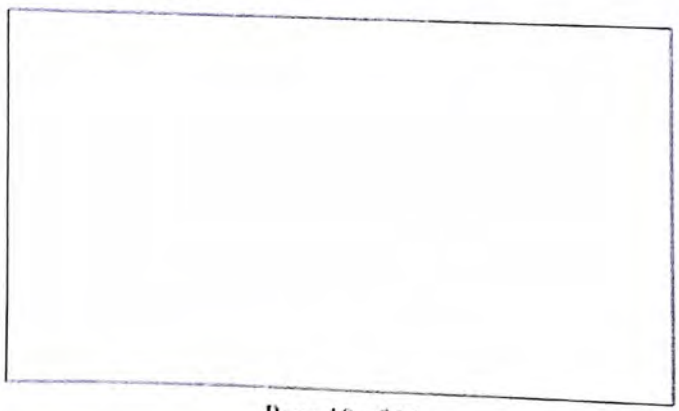
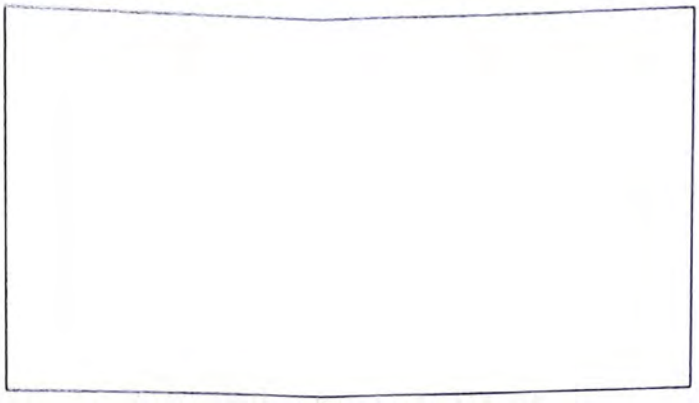
(e) Draw the electrical symbol which represents each of the following accessories:

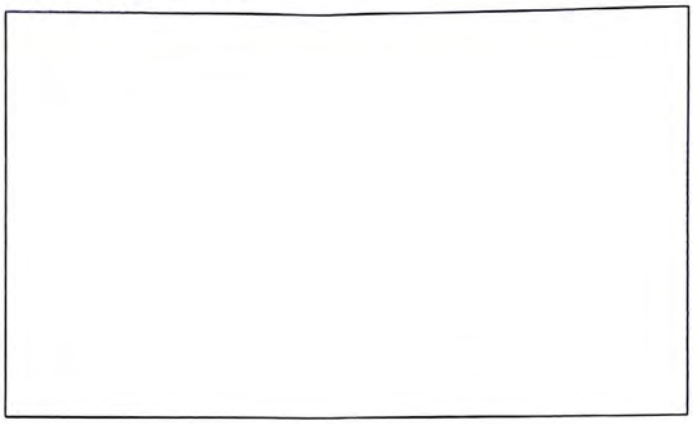
(i) Two-way switch.



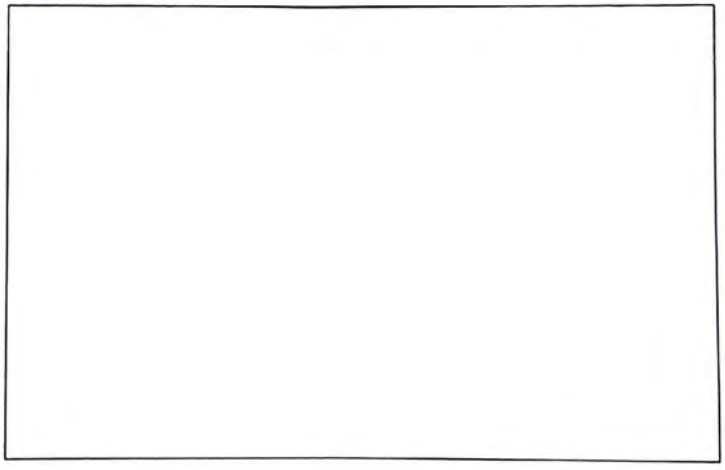
(ii) Switch-socket.



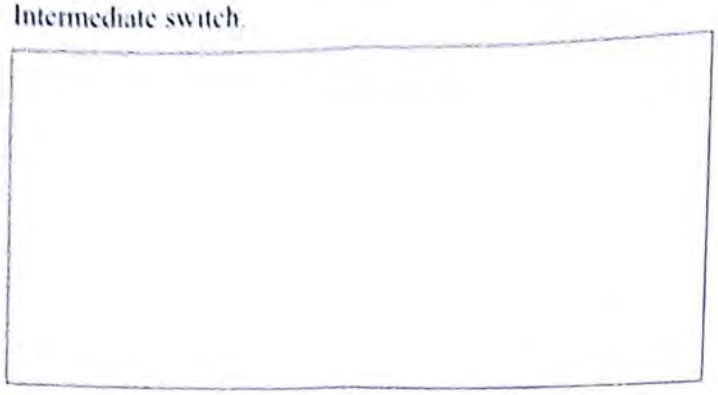
(iii) Cooker control unit.



(iv) Pull switch.



(v) Intermediate switch.



PART II
ELECTRONICS, RADIO AND TV SERVICING

Answer **all** questions in this part.

11. (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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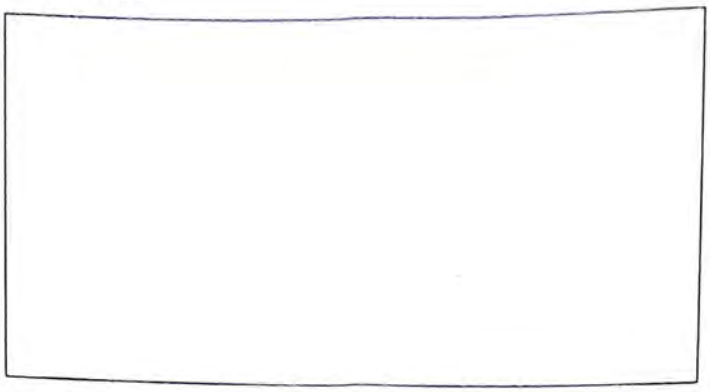
(b) Draw electronic symbol for each of the following components:

(i) Aerial

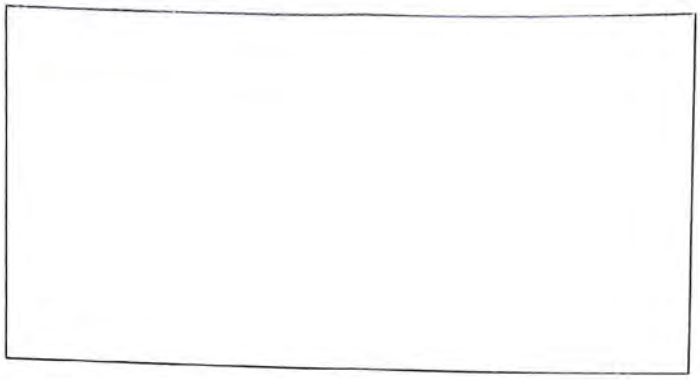
(ii) Loudspeaker

(iii) Battery

(iv) Zener diode



(v) Fixed resistor



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

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(ii) Three capacitors C1=4μF, C2 = 3 μF and C3 = 2 μF are connected in such a way that, C1 and C2 are connected in series and C3 is connected in parallel to them. Calculate the overall capacitance.

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

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

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(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.

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