**ELECTRICITY *(Theory)***

**Paper 1**

**BUNAMFAN CLUSTERS EXAM 2022 (TERM 1 2022)**

**MARKING SCHEME**

**SECTION A** (48 marks)

1. (a) List **four** insulating materials used in electrical installations.
* ***PVC***
* ***Glass fibre***
* ***Mica***
* ***Cotton paper and any other correct @ ½ =2 marks***

 (b) State **two** advantages of mineral insulated copper sheathed cables over PVC sheathed.

* ***Requires no further protection.***
* ***Impervious to water and oil.***
* ***Long lasting.***
* ***Good heat resistance***. ***@ ½ =2 marks***
1. (a) State Lenz’s law of electromagnetic induction.
* ***states that the direction of the current induced in a conductor by a changing magnetic field is such that the*** [***magnetic field***](https://www.electrical4u.com/magnetic-field/) ***created by the induced*** [***current***](https://www.electrical4u.com/electric-current-and-theory-of-electricity/)opposes ***the initial changing magnetic field which produced it. Correctly stated @ 2 marks***

(b) Name **four** applications of electromagnets.

* ***Door bells, buzzers and chimes.***
* ***Relays.***
* ***Circuit breakers.***
* ***Telephone receivers.***
* ***Loud speakers.***
* ***Measuring instruments.***
* ***Sorting magnetic materials from scrap metals.***
* ***Record and play heads of cassette recorders.***
* ***Lifting magnetic materials.***
* ***Field poles for motors and generators. Any 4 correct @ ½ =2 marks***
1. (a) Name **four** National Polytechnics in Kenya.
* ***Kisumu polytechnic***
* ***Eldoret polytechnic***
* ***Kabete National Polytechnic***
* ***Meru National Polytechnic***
* ***Mombasa National Polytechnic***
* ***Nyeri National Polytechnic***
* ***Kisii National Polytechnic***
* ***Sigalagala National Polytechnic***
* ***North Eastern Province National Polytechnic***
* ***Kitale National Polytechnic Any 4 correct @ ½ =2 marks***

(b) List **two** business opportunities in the field of electricity.

* ***Electrical/electronics shop***
* ***Repair workshop***
* ***Electrical contractor Any 2 correct @ ½ =2 marks***
1. (a) State how each of the following electrical material waste should be disposed safely:
2. Burnt fluorescent tubes;
* ***Recycle @ ½ =½ mark***
1. Damaged computers.
* ***Recycle @ ½ =½ mark***

(b) State the application of each of the following types of extinguishers:

1. Carbon dioxide;
* ***To put out burning gases or vapour @ ½ =½ mark***
1. Water.
* ***Burning solid materials @ ½ =½ mark***
1. (a) **Figure 1** shows a carbon resistor with color codes. Determine the value of the resistor given, (2 marks)

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1. **Figure 2** shows a resistive circuit.

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Determine the:

1. Value of the resistor **B** if the total circuit resistance is 20Ω; (4 marks)
2. Total circuit current. (2 marks)
3. (a) Name **four** parts of a fluorescent fitting. (2 marks)

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1. List four marking out tools used in fabricating sheet metal casing. (2 marks)

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1. (a) **Figure 3** shows two views of an object drawn in third angle projection.



On the grid provided, make a free hand isometric sketch with corner N as the lowest point. (3 marks)



(b) Outline **two** ways that can be used to troubleshoot a faulty television. (2 marks)

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1. (a) With the aid of sketches, distinguish between P-N-P and an N-P-N transistor. (3 marks)

(b) **Name four** applications of a P-N junction diode. (2 marks)

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1. (a) State three advantages of digital instruments over analogue instruments. (3 marks)

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(b) An ideal transformer connected to a 240V mains supplies a 12V, 120W lamp. Calculate the:

1. Transformer’s turns ratio; (3 marks)
2. Current taken from the supply. (3 marks)

**SECTION B** (*52 marks*)

*Answer any four questions in the spaces provided.*

1. (a) (i) Convert 2310 to binary. (2 marks)

(ii) Convert 110112 to decimal. (2 marks)

(b) Draw a truth table for each of the following logic gate;

 (i) NOR; (4 marks)

 (ii) NAND. (4 marks)

(c) Name two applications of logic gates. (1 mark)

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1. (a) Draw a sine wave and indicate the following:
2. Peak value; (5 marks)
3. Instantaneous value;
4. Cycle.

(b) **Figure 4** shows an RLC circuit.



Calculate the:

1. Inductive reactance; (2 marks)
2. Capacitive reactance; (2 marks)
3. Circuit impedance; (2 marks)
4. Circuit current. (2 marks)
5. (a) State;
6. **Two** advantages of a moving coil instrument. (2 marks)

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1. **Two** essential features of an analogue instrument. (2 marks)

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(b) With the aid of a labelled diagram, explain the Flemmings right hand rule to demonstrate the direction of induced EMF. (6 marks)

(c) show that for two capacitors C1 and C2 connected in series, the total capacitance is given by:

$$C\_{T}=\frac{C\_{1}×C\_{2}}{C\_{1}+C\_{2}}$$

(3 marks)

1. (a) State:
2. **Two** advantages of trunking over steel conduit wiring systems. (2 marks)

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1. **Two** advantages of MCBs over rewirable fuses. (2 marks)

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(b) (i) Draw and label a diagram of a switch start fluorescent fitting. (6 marks)

(ii) Outline **three** tests carried out in a completed electrical installation. (3 marks)

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1. **Figure 5** shows a machine block drawing of an isometric projection.



Draw the following views in **full size** in first angle projection:

1. Front elevation in the direction of arrow **F**:
2. Plan;
3. Indicate **six** dimensions. (13 marks)

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