

Name.....ADM No..... Class.....

**448/1**  
**ELECTRICITY**  
**Paper 1**  
**(THEORY)**  
**AUGUST-SEPTEMBER 2022**  
**Time: 2 ½ hours**

**MECS CLUSTER JOINT EXAMINATION**

**FORM FOUR END YEAR EXAMINATION 2022**  
**ELECTRICITY**

**INSTRUCTIONS TO CANDIDATES**

1. Write your name, admission number and class in the spaces provided
2. Each candidate should have the following:
  - Drawing paper, **A4**
  - Drawing instruments
  - Electronic calculator
3. This paper has two sections; **A** and **B**
4. Answer **ALL** the questions in section **A** and **ANY FOUR** in section **B**
5. All measurements are in millimeters unless it is stated otherwise .

*This paper consists of 11 printed pages, a certain that all pages are printed and no questions are missing*

**SECTION A** (48marks)

*Answer all the questions in this section in the spaces provided*

1. (a) List **four** insulating materials used in electrical installations. (2 marks)

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- (b) State **two** advantages of mineral insulated copper sheathed cables over PVC sheathed. (2 marks)

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2. (a) State Lenz’s law of electromagnetic induction. (2 marks)

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- (b) Name **four** applications of electromagnets. (2 marks)

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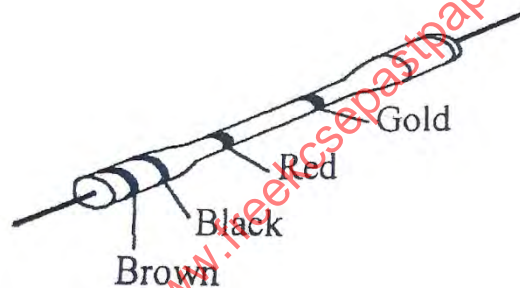
3. (a) Name **four** National Polytechnics in Kenya. (2 marks)

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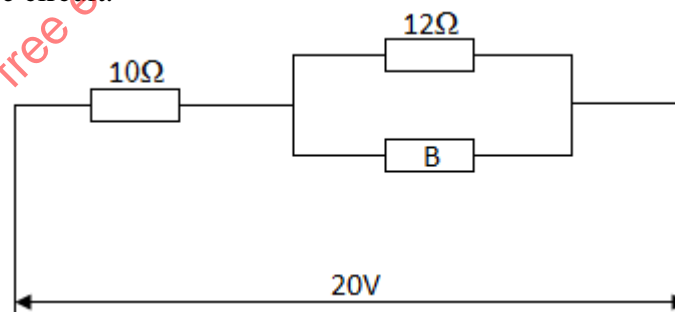
- (b) List **two** business opportunities in the field of electricity. (1 mark)

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4. (a) State how each of the following electrical material waste should be disposed safely:
- (i) Burnt fluorescent tubes; (½ mark)
- .....
- .....
- (ii) Damaged computers. (½ mark)
- .....
- .....
- (b) State the application of each of the following types of extinguishers:
- (i) Carbon dioxide; (1 mark)
- .....
- .....
- (ii) Water. (1 mark)
5. (a) **Figure 1** shows a carbon resistor with color codes. Determine the value of the resistor given, (2 marks)



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



Determine the:

- (a) Value of the resistor **B** if the total circuit resistance is 20Ω; (4 marks)
- (b) Total circuit current. (2 marks)

7. (a) Name **four** parts of a fluorescent fitting. (2 marks)

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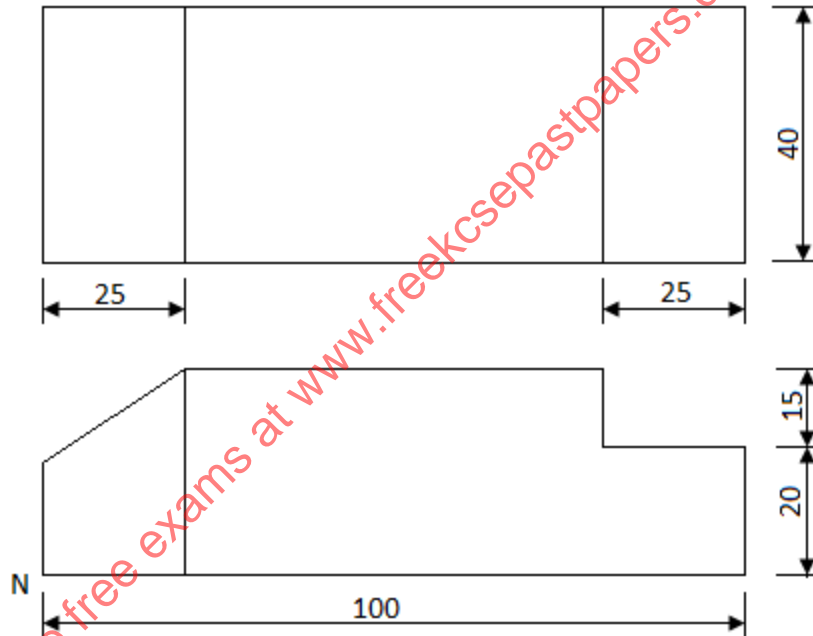
(b) List four marking out tools used in fabricating sheet metal casing. (2 marks)

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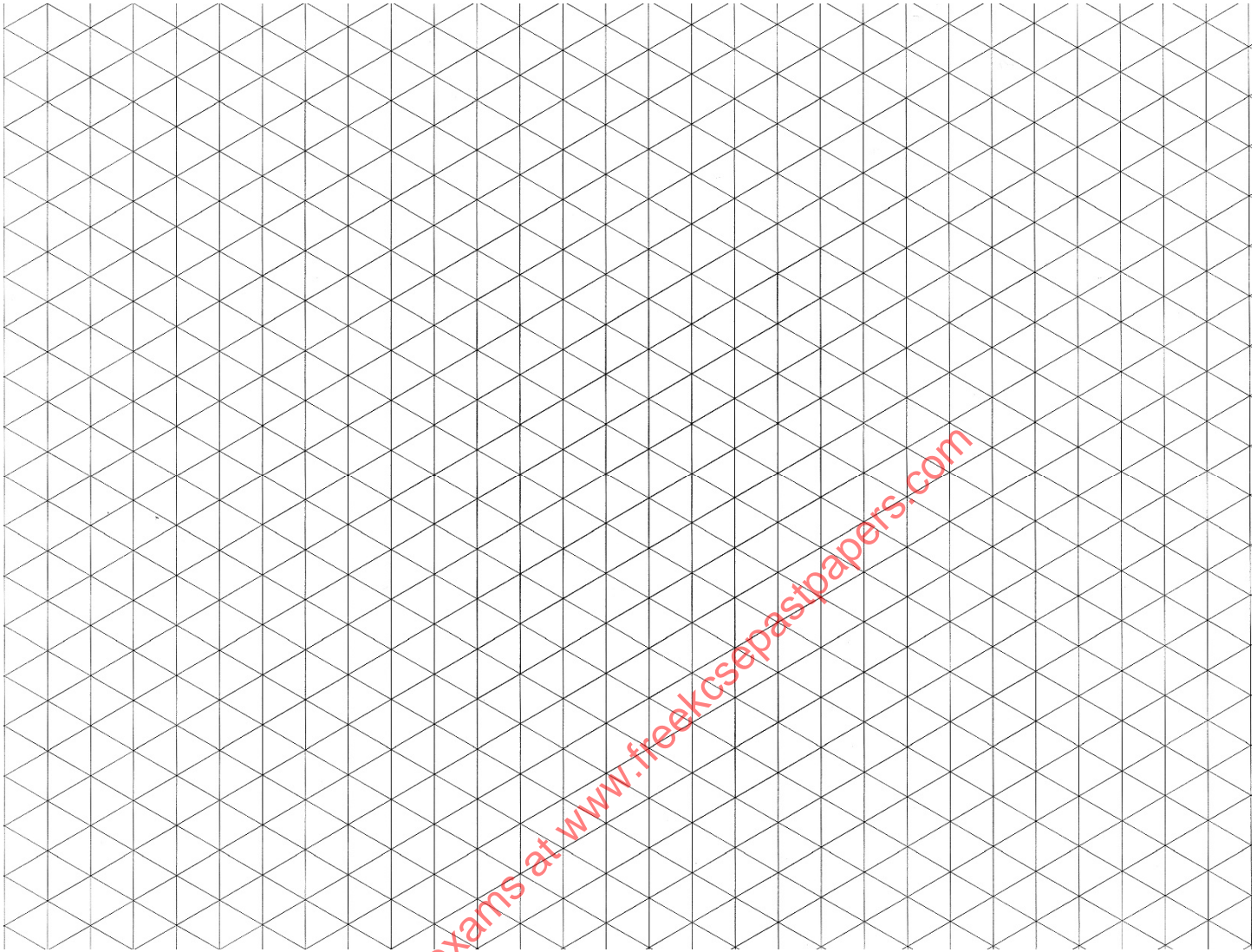
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8. (a) **Figure 3** shows two views of an object drawn in third angle projection.



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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9. (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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10. (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:  
(i) Transformer's turns ratio; (3 marks)

(ii) Current taken from the supply. (3 marks)

(c) With the aid of diagram describe 'armature reaction' in d.c motors (3mks)

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**SECTION B** (52 marks)

*Answer any four questions in the spaces provided.*

11. (a) (i) Convert  $23_{10}$  to binary. (2 marks)

(ii) Convert  $11011_2$  to decimal. (2 marks)

(b) state seven types of logic gate; (4 marks)

(ii) Draw a truth table for the; NAND. (4 marks)

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

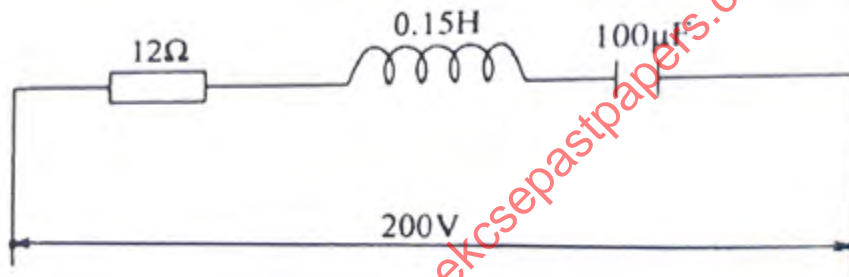
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12(a) Draw a sine wave and indicate the following:

- (i) Peak value;
- (ii) Instantaneous value;
- (iii) Cycle.

(5 marks)

(b) **Figure 4** shows an RLC circuit. The supply frequency is 50Hz



Calculate the:

- (i) Inductive reactance;

(2 marks)

- (ii) Capacitive reactance;

(2 marks)

- (iii) Circuit impedance;

(2 marks)

- (iv) Circuit current.

(2 marks)



- 13.(a) State;
- (i) **Two** advantages of a moving coil instrument. (2 marks)

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- (ii) **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  $C_1$  and  $C_2$  connected in series, the total capacitance is given by:

$$C_T = \frac{C_1 \times C_2}{C_1 + C_2}$$

(3 marks)

14.(a) State:

(i) **Two** advantages of trunking over steel conduit wiring systems. (2 marks)

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(ii) **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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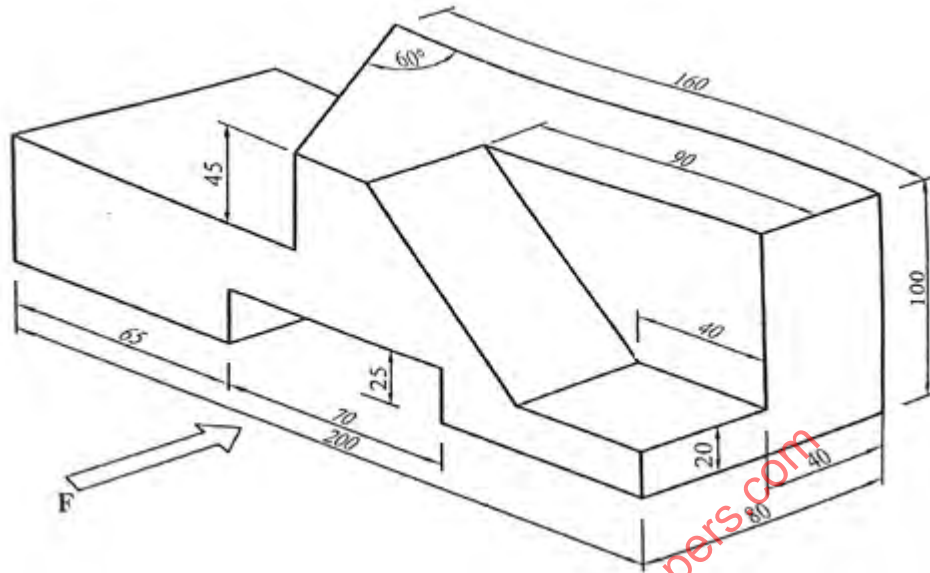
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15. Figure 5 shows a machine block drawing of an isometric projection.



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

- (a) Front elevation in the direction of arrow **F**;
- (b) Plan;
- (c) Indicate **six** dimensions.

(13 marks)

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