3.20 ELECTRICITY (448)

3.20.1 Electricity Paper 1 (448/1)

SECTION A (48 marks)

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

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

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

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

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

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

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

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 fire extinguishers:

(i) Carbon dioxide; (1 mark)

(ii) Water. (1 mark)

5. (a) **Figure 1** shows a carbon resistor with colour codes. Determine the value of the resistor given. (2 marks)

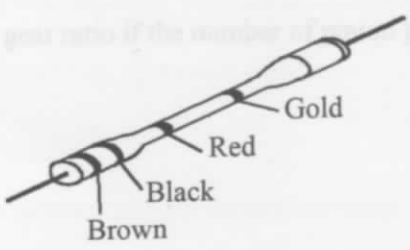

Figure 1

(b) Name **three** factors that determine resistance of a material. (3 marks)

Determine the:

(a) value of the resistor **B** if total circuit resistance is 20Ω; (4 marks)

(b) total circuit current. (2 marks)

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

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

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

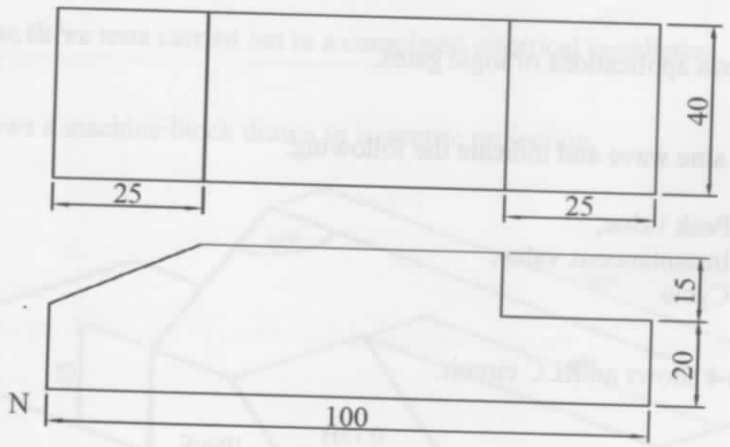

Figure 3

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

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

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

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

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

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

Calculate the:

(i) transformer's turns ratio; (3 marks)

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

SECTION B (52 marks)

*Answer any **four** questions from this section in the spaces provided.*

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

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

(b) Draw a truth table for each of the following logic gates:

(i) NOR; (4 marks)

(ii) NAND. (4 marks)

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

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.

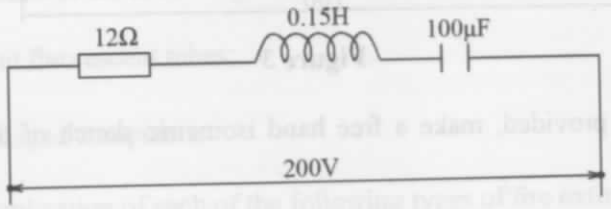

Figure 4

Calculate the:

(i) inductive resistance; (2 marks)

(ii) capacitive resistance; (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)

(ii) **two** essential features of an analogue instrument. (2 marks)

(b) With the aid of a labelled diagram, explain the Fleming's 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)

(ii) **two** advantages of MCBs over rewirable fuses. (2 marks)

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

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

15. **Figure 5** shows a machine block drawn in isometric projection.

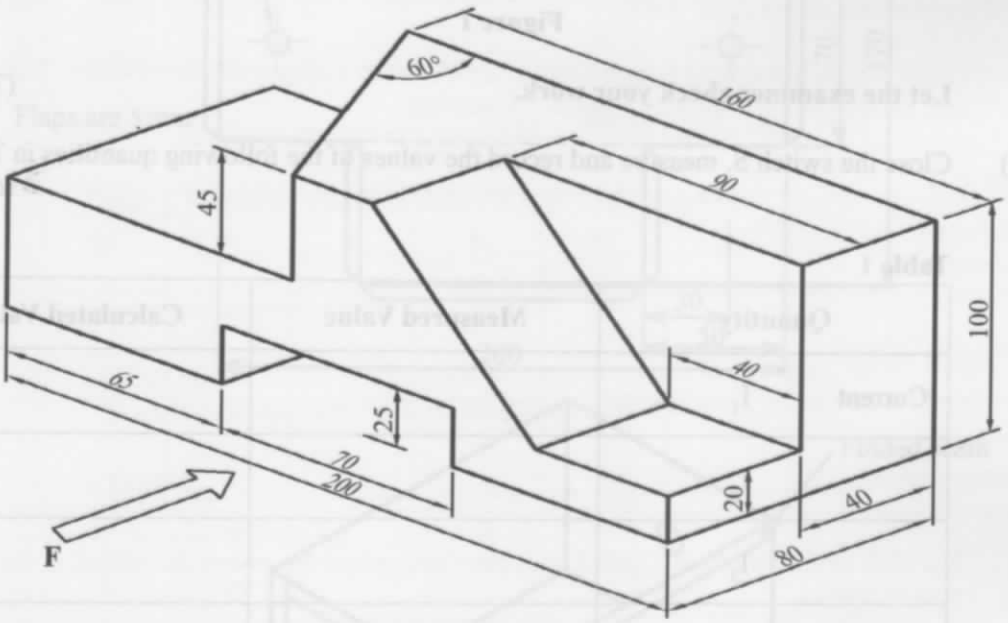

Figure 5

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

(a) Front elevation in the direction of arrow **F**;

(b) Plan;

(c) Indicate **six** dimensions. (13 marks)