3.20 ELECTRICITY (448)

3.20.1 Electricity Paper 1 (448/1)

SECTION A (48 marks)

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

1 (a) State the name of the institution into which each of the following was upgraded:

(i) Kenya Polytechnic;
(ii) Mombasa Polytechnic. (1 mark)

(b) State the main duty of class A2 Electrical License holder. (1 mark)

2 (a) Name the materials used to make the parts of an AC machine in **table 1** and in each case state **one** reason why the material is used.

Table 1

PART	MATERIAL	REASON
Brushes	.....	.....
Slip rings	.....	.....

(3 marks)

(b) State the **three** factors to consider when choosing a motor for a particular installation. (3 marks)

3 Draw a ring final circuit diagram with four socket outlets and a spur. (5 marks)

4 (a) State **two** factors that determine the resistance of a conductor. (2 marks)

(b) Determine the colour code of a 1500 Ω±5% carbon resistor. (3 marks)

5 (a) (i) **Figure 1** shows a pair of current - carrying conductors. Draw the magnetic flux around the conductors. (2 marks)

Figure 1

(ii) Name the type of force that exists between the conductors in a(i) above.

(b) With the aid of a labelled diagram show how each of the following permanent magnets are stored to preserve their magnetism: (2 marks)

(i) horse shoe;

(ii) bar.

6 (a) Name **four** faults that occur in electric circuits. (2 marks)

(b) State **two** ways of increasing the magnetic field strength of a moving coil instrument. (2 marks)

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

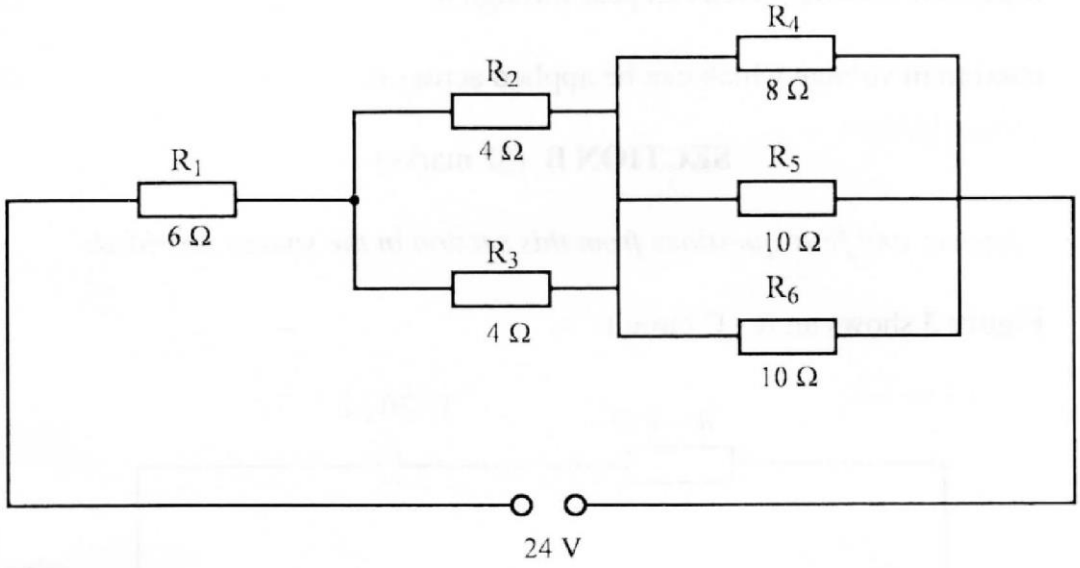

Fig. 2

Calculate:

(a) total resistance of the circuit; ($3\frac{1}{2}$ marks)

(b) current through R6. ($2\frac{1}{2}$ marks)

8 (a) State **two** safety precautions to be observed when using each of the following:

(i) arc welding machine;

(ii) microwave oven. (4 marks)

(b) Name **four** non-ferrous metals used in manufacturing electrical components. (2 marks)

9 (a) State **four** qualities of successful entrepreneurs. (2 marks)

(b) Sketch the correct symbol for each of the following electronic components: (3 marks)

(i) cored inductor;
(ii) LED;
(iii) electrolytic capacitor.

10 A 47 kΩ carbon resistor has a power rating of $\frac{1}{4}$ W.
Determine the:

(a) maximum current which can pass through it. ($2\frac{1}{2}$ marks)

(b) maximum voltage which can be applied across it. ($2\frac{1}{2}$ marks)

SECTION B (52 marks)

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

11 (a) **Figure 3** shows an R - C circuit.

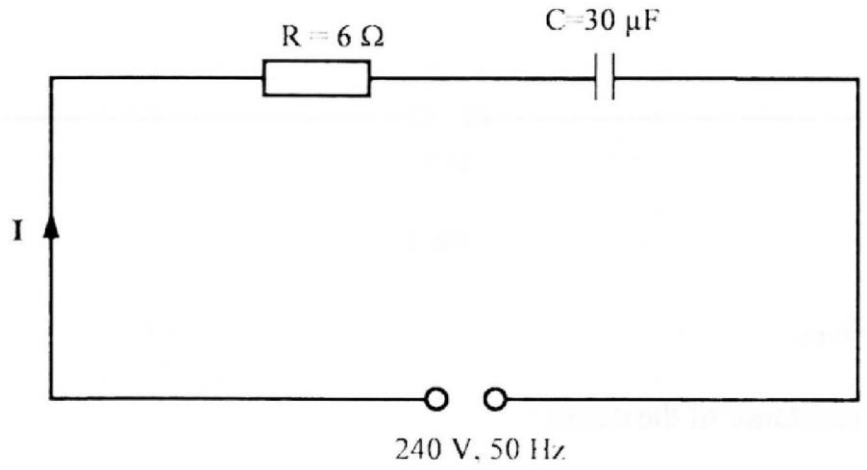

Fig. 3

Calculate the:

(i) impedance; (2 marks)
(ii) current I; (2 marks)
(iii) phase angle. (2 marks)

(b) Draw a labelled diagram of a continuous ringing bell. (7 marks)

12 **Figure 4** shows a block drawn in isometric projection.

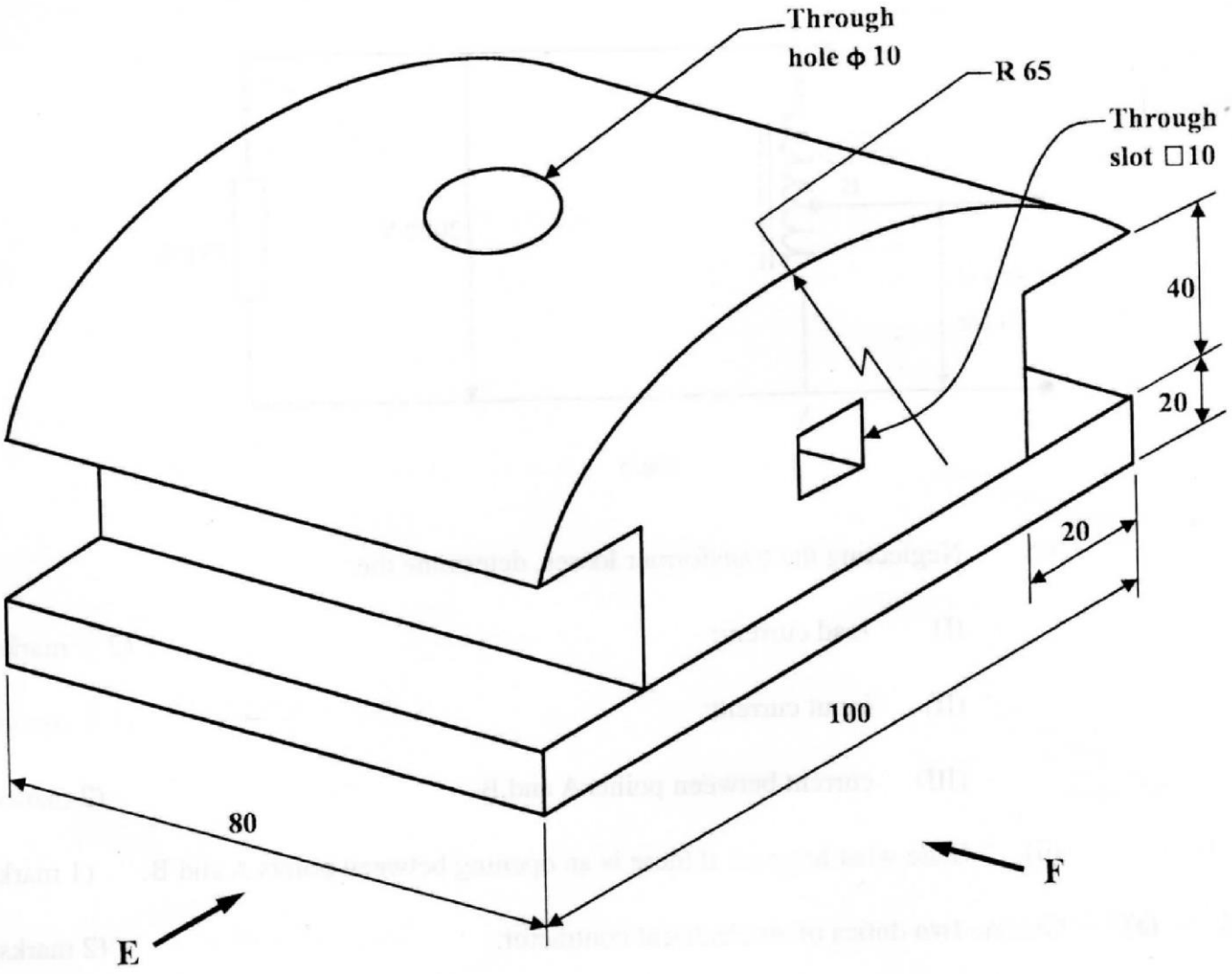

Fig. 4

Using first angle projection draw the following views full size:

(a) front elevation in the direction of arrow F;
(b) end elevation in the direction of arrow E;
(c) plan.

(13 marks)

(Use A_3 paper provided)

13 (a) State **three** reasons why autotransformers are more efficient than double wound transformers of the same rating. (3 marks)

(b) Outline **three** functions of oil in a transformer. (3 marks)

(c) **Figure 5** shows a step-up transformer supplying a load of 75 kW at unity power factor.

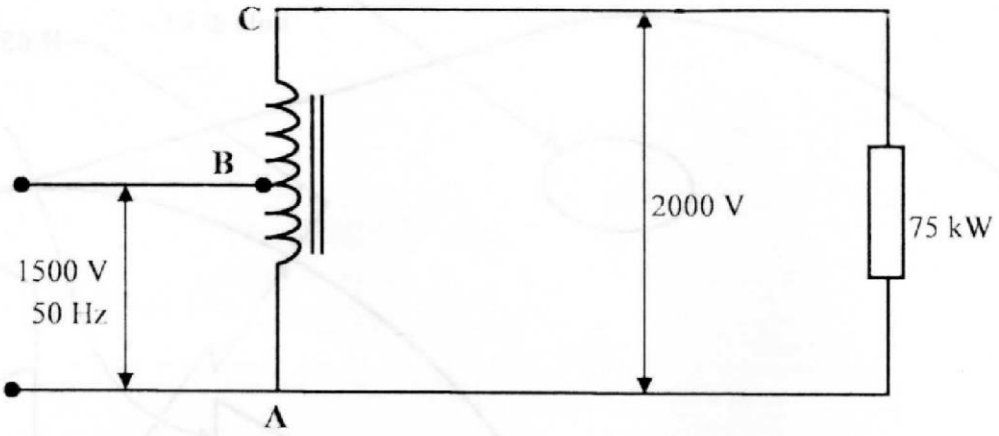

Fig.5

(i) Neglecting the transformer losses, determine the:

(I) load current; ($2\frac{1}{2}$ marks)

(II) input current; ($1\frac{1}{2}$ marks)

(III) current between points A and B. (2 marks)

(ii) State what happens if there is an opening between points A and B. (1 mark)

14 (a) Outline **two** duties of an electrical contractor. (2 marks)

(b) State **two** reasons for carrying out installation resistance test in an installation. (2 marks)

(c) (i) Draw and label a filament lamp. (6 marks)

(ii) A fluorescent lamp flickers in an effort to start. State **three** possible causes for this action. (3 marks)

15 (a) **Figure 6** shows a NAND gate in a circuit.

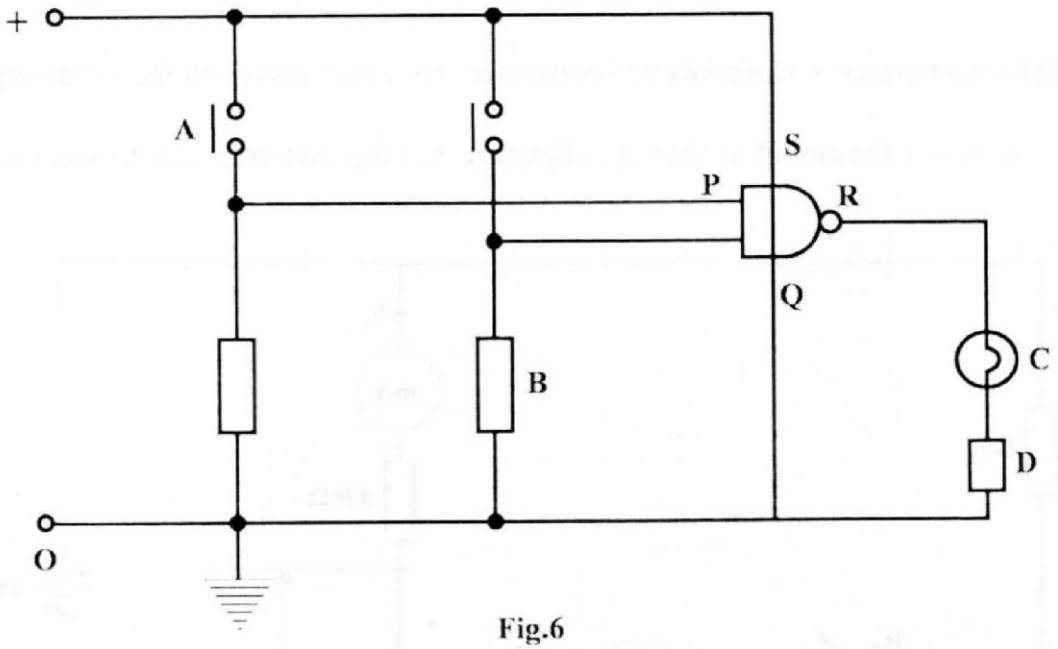

Fig.6

(i) Names the parts labelled P, Q, R and S. (4 marks)

(ii) State the functions of components A, B, C and D. (4 marks)

(b) **Figure 7** shows a capacitor discharge circuit.

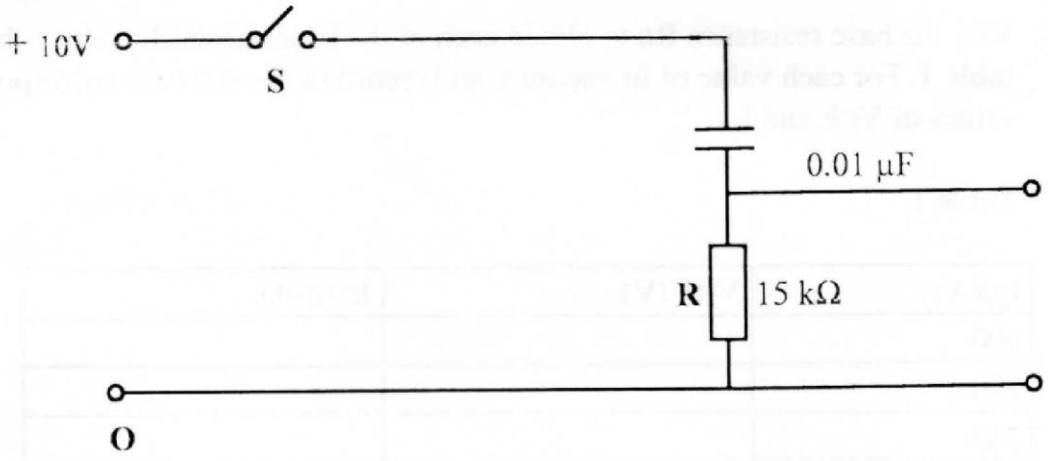

Fig.7

(i) Sketch the output voltage - time waveform when switch S is closed. (2 marks)

(ii) Determine the duration taken to fully discharge the capacitor. (3 marks)