

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 $1500 \Omega \pm 5\%$ 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)
- horse shoe;
 - 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.

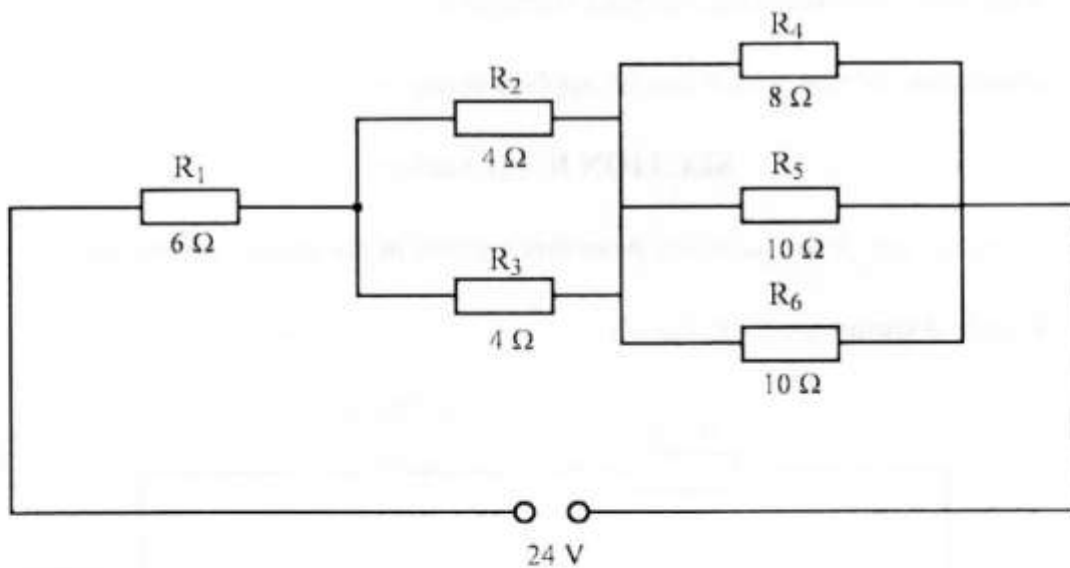


Fig. 2

Calculate:

- total resistance of the circuit; (3 $\frac{1}{2}$ marks)
 - current through R_6 . (2 $\frac{1}{2}$ marks)
- 8 (a) State **two** safety precautions to be observed when using each of the following: (4 marks)
- arc welding machine;
 - microwave oven.
- (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)
- cored inductor;
 - LED;
 - electrolytic capacitor.

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

- (a) maximum current which can pass through it. (2½ marks)
- (b) maximum voltage which can be applied across it. (2½ 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.

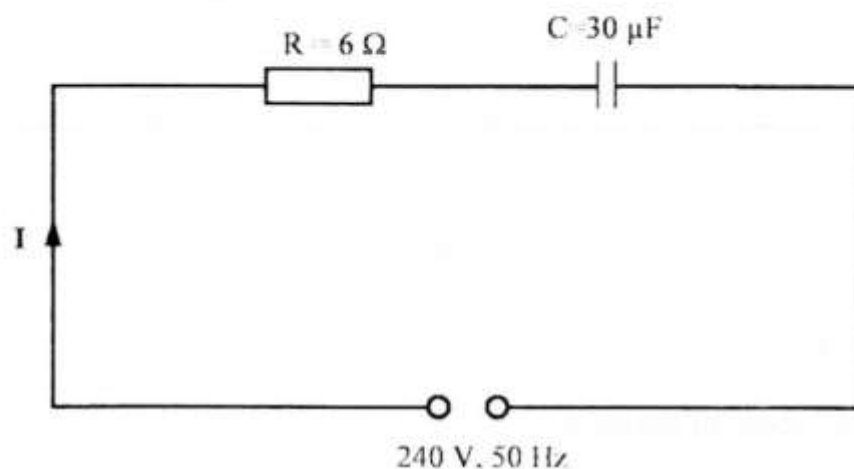


Fig. 3

Calculate the:

- impedance; (2 marks)
 - current I ; (2 marks)
 - 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.

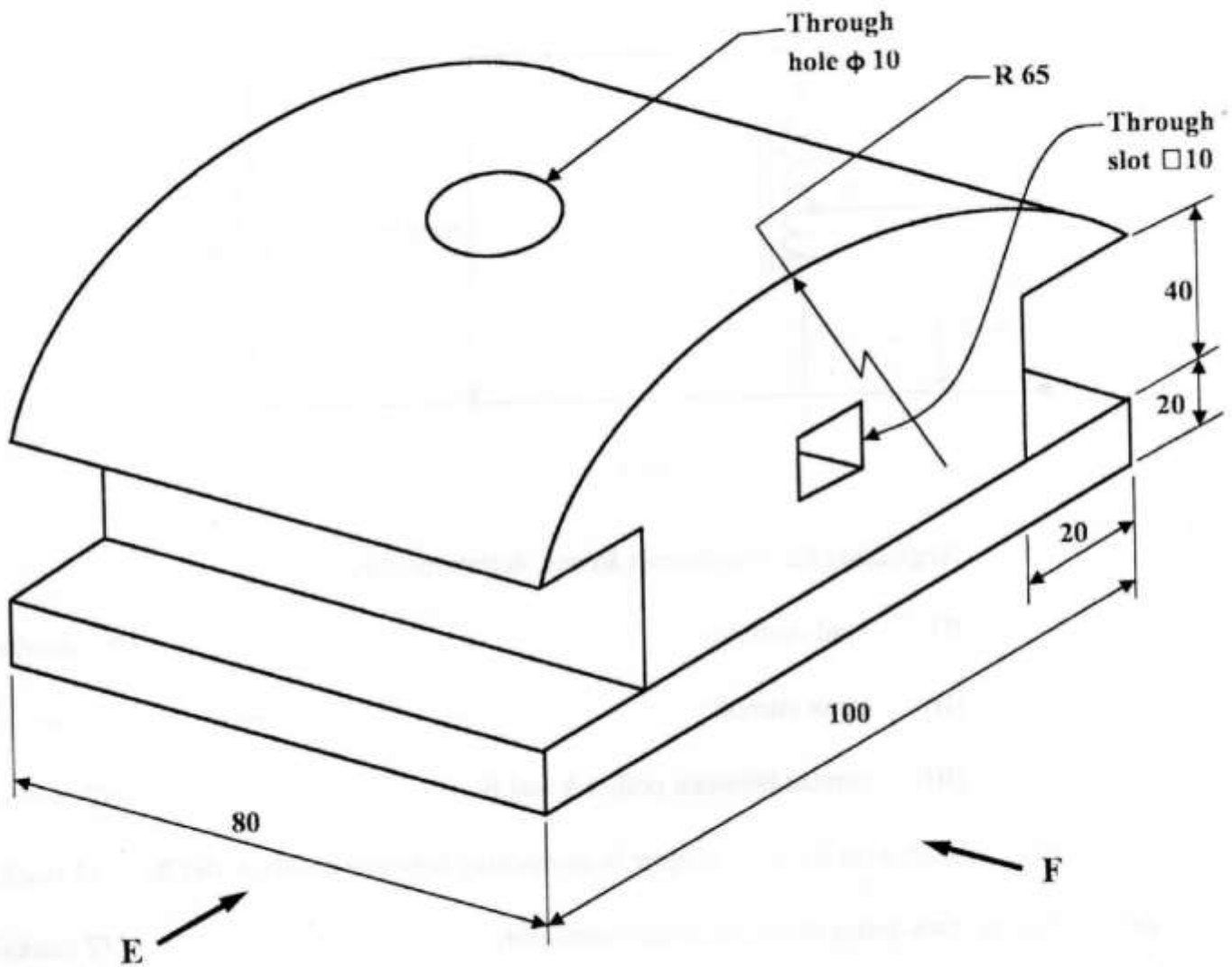


Fig. 4

Using first angle projection draw the following views full size:

- front elevation in the direction of arrow F;
- end elevation in the direction of arrow E;
- plan.

(13 marks)

(Use A₃ paper provided)

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

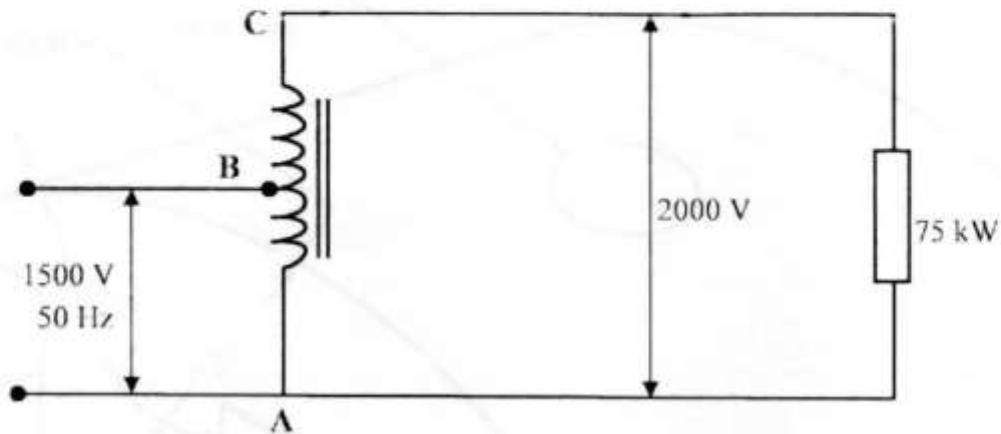


Fig.5

- (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.

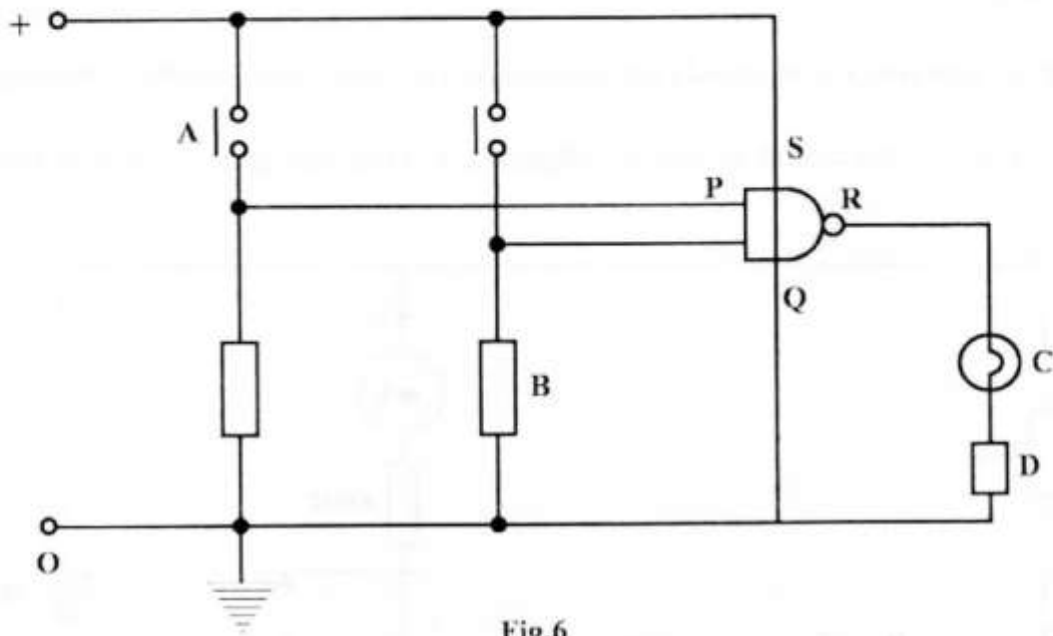


Fig.6

(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.

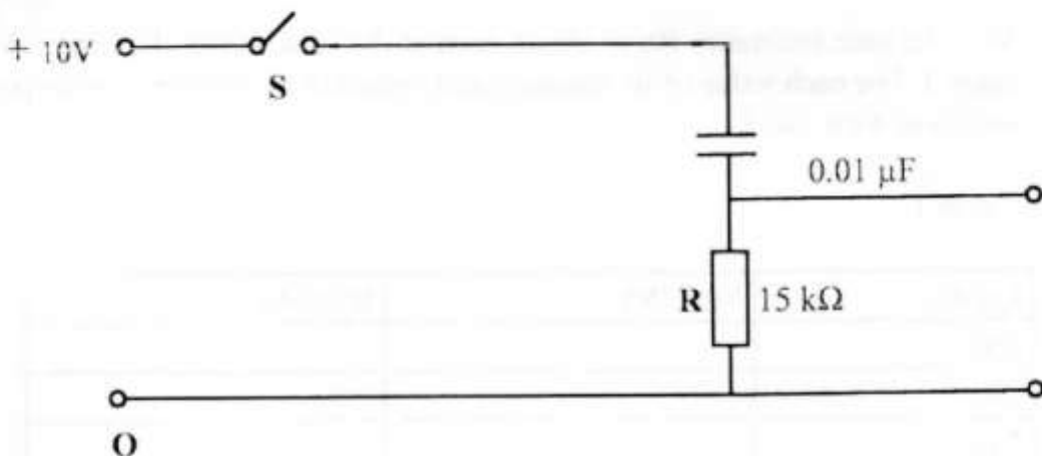


Fig.7

(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)