

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) Outline the procedure of connecting an ammeter to take a measurement in a circuit. (2 marks)
- (b) **Figure 1** shows a resistor with colour bands.

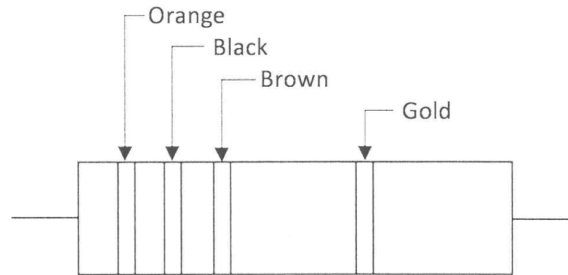


Figure 1

Determine its:

- (i) nominal resistance; (1 mark)
- (ii) maximum resistance. (2 marks)
- 2 (a) State **two** reasons for using a circuit diagram when troubleshooting an electrical equipment. (2 marks)
- (b) State **four** components of a bill of materials in project fabrication. (2 marks)
- 3 (a) Explain the effect of each of the following in a p-n junction: (2 marks)
- (i) forward bias;
- (ii) reverse bias.
- (b) State the meaning of each of the following ratings of a light emitting diode: (2 marks)
- (i) $I_{F(max)}$;
- (ii) $V_{F(typ)}$.

- 4 **Figure 2** shows a transformer whose primary impedance is $1\text{ k}\Omega$.

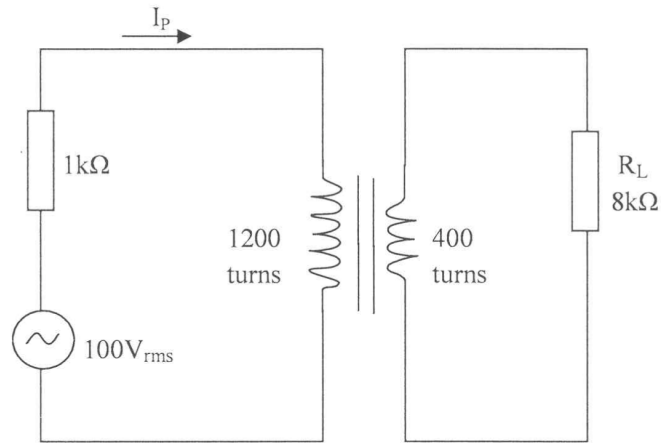


Figure 2

Determine the:

- primary current I_p ;
- voltage across R_L .

- 5 With the aid of labelled diagrams, illustrate the arrangement of magnetic domains in:

- unmagnetised material;
- magnetised material.

(3 marks)

- 6 (a) **Figure 3** shows a voltage divider circuit.

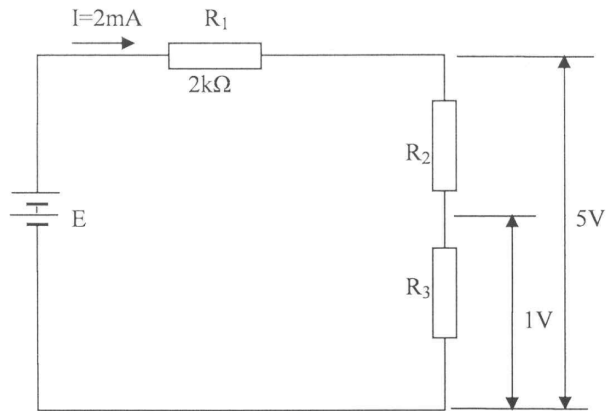


Figure 3

Determine the value of;

- E ;

- (ii) R_2 ;
- (iii) R_3 . (4 marks)

(b) A consumer has the following loads connected to the supply:

- (i) five 60 W lights for 4 hours;
(ii) one 2 kW kettle for $\frac{1}{2}$ hour.

Calculate the total:

- (i) energy consumed;
(ii) cost of energy used if the rate is 80 cents per unit.

(3 marks)

7 (a) State **three** safety precautions to be observed by an operator using a portable electric drill. (3 marks)

(b) Name **four** communication service provider companies currently operating in Kenya. (2 marks)

8 (a) Name **four** types of insulating materials used in electrical circuits. (2 marks)

(b) State **three** advantages of PVC conduit wiring systems. (3 marks)

9 (a) Calculate the inductance required to cause resonance at 150 kHz when the capacitance is 1.0 pF. (2 marks)

(b) In a 240V circuit, the load current is 2.5 A. If the power factor is 0.6, calculate:

(i) apparent power;

(ii) true power.

(3 marks)

10 Make a free hand isometric drawing of a conduit saddle. (5 marks)

SECTION B (52 marks)

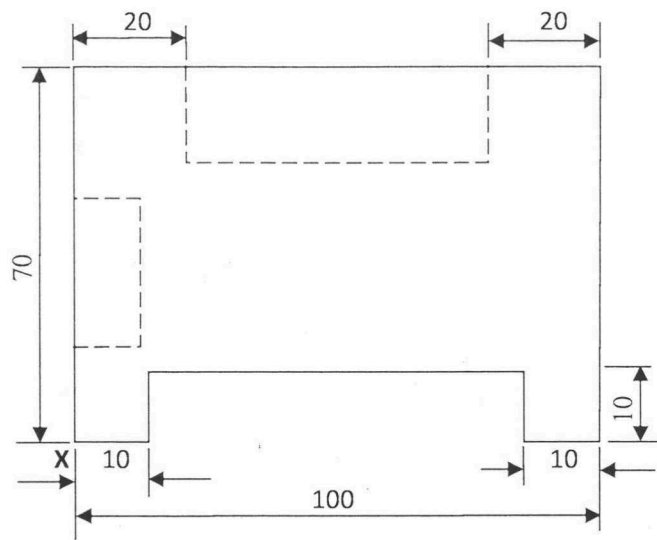
*Answer any **four** questions from this section in the spaces provided.*

11 **Figure 4**, in the next page, shows the front elevation, end elevation and an incomplete plan of an object.

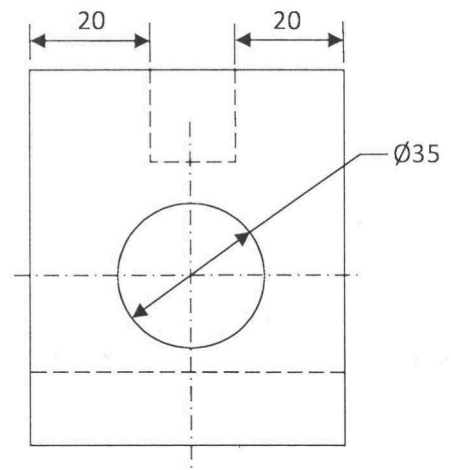
(a) Complete the plan;

(b) On the isometric grid provided, draw the isometric projection of the object making X the lowest point.

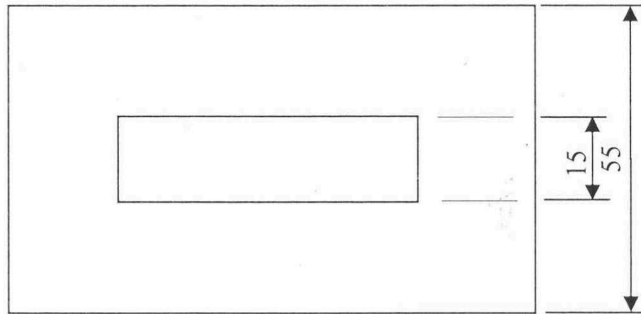
(13 marks)



FRONT ELEVATION



END ELEVATION



PLAN

Figure 4

12 **Figure 5** shows waveforms A and B. Their vertical and horizontal scales are given.

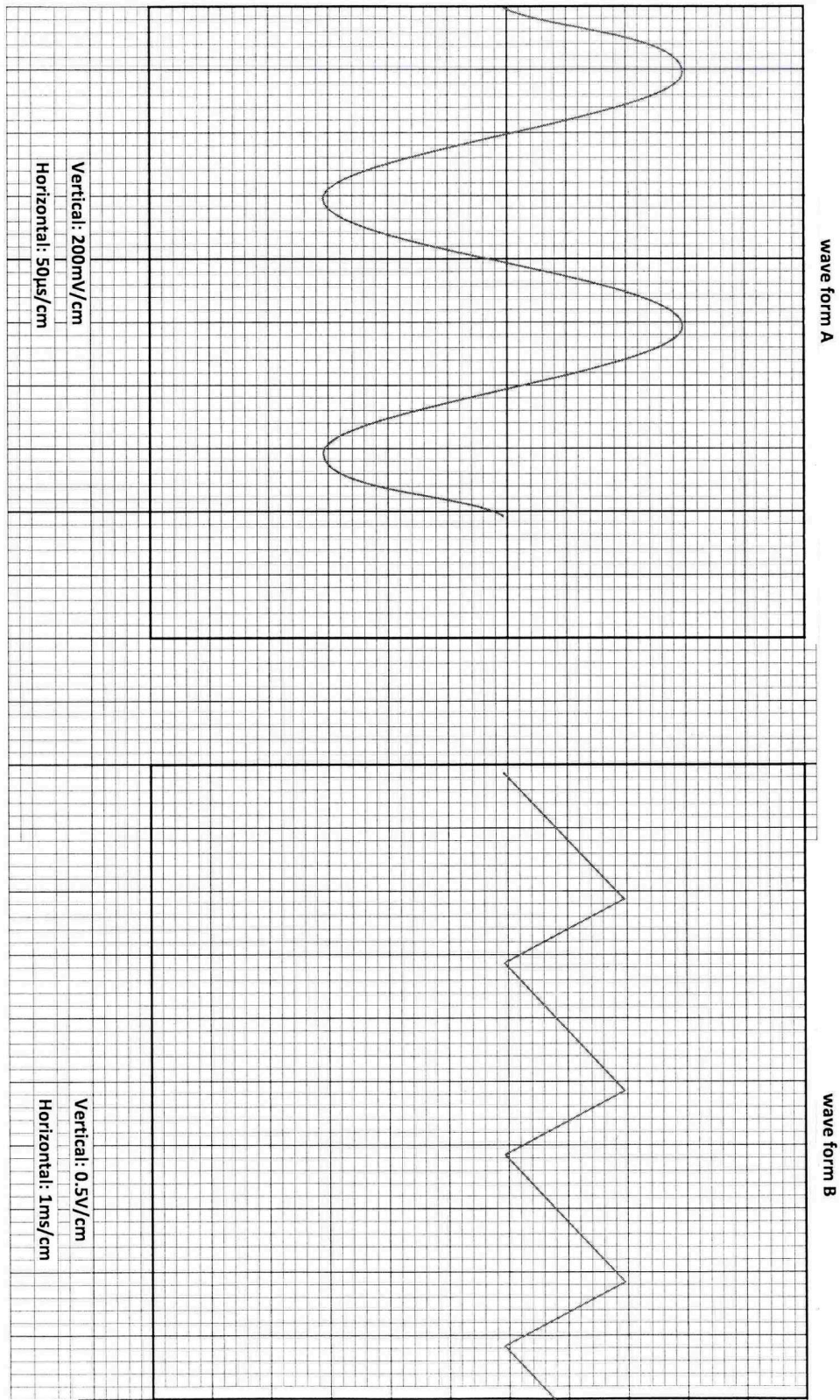


Figure 5

- (a) Name each of the **two** waveforms. (1 mark)
 - (b) State the number of cycles displayed in each waveform. (2 marks)
 - (c) Calculate:
 - (i) frequency of waveform A;
 - (ii) amplitude of each waveform;
 - (iii) RMS voltage of waveform A.
- (10 marks)

- 13** (a) Draw a labelled diagram of a consumer unit with the following final circuits.
- (i) lighting circuit;
 - (ii) water heater circuit;
 - (iii) bell circuit;
 - (iv) cooker circuit;
 - (v) ring circuit.
- (11 marks)
- (b) State the typical fuse ratings for any **four** of the final circuits in (a). (2 marks)

14 **Figure 6** shows an amplifier circuit whose current gain is 50.

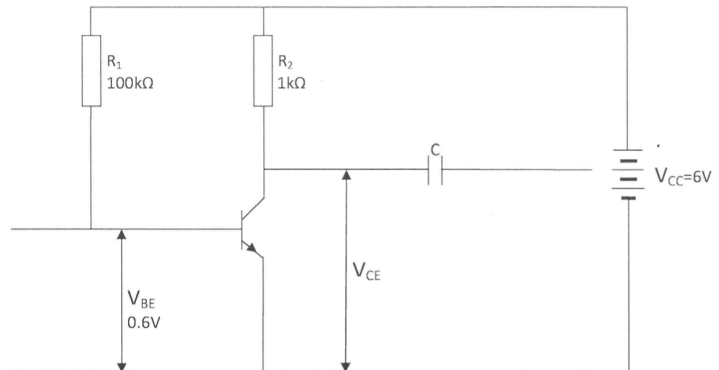


Figure 6

- (a) (i) Name the type of transistor;
 - (ii) State the function of the capacitor C.
 - (iii) Name the type of biasing.
- (3 marks)
- (b) Calculate the values of: (10 marks)
- (i) voltage across R_1 ;
 - (ii) base current I_B ;

(iii) collector current I_C ;

(iv) voltage V_{CE} .

15 **Figure 7** shows an R-L-C circuit.

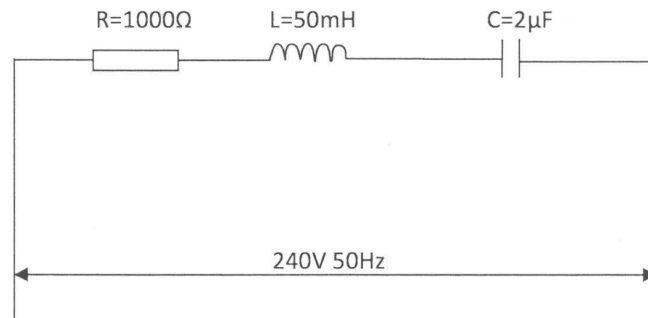


Figure 7

(a) Calculate the:

(i) impedance of the circuit;

(7 marks)

(ii) current.

(3 marks)

(b) Draw the phasor diagram.

(3 marks)