

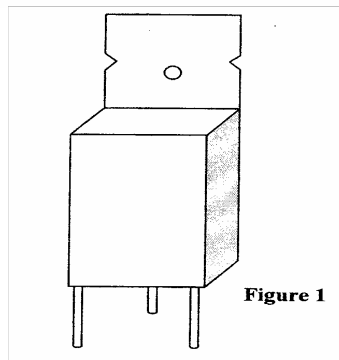
SECTION A (52 marks)

Answer all the questions in this section.

- 1 (a) State **three** safety precautions to be observed when using electric power tools. (1½ marks)
- (b) State **three** requirements for proper storage of electrical measuring instruments. (1½ marks)
- (c) Arrange the following job titles in ascending order of seniority: craftsman, engineer, artisan and technician. (2 marks)
- 2 (a) Explain why a file must not be used to clean the bit of an electric soldering iron. (1 mark)
- (b) Explain each of the following electric circuit conditions:
- (i) short circuit;
- (ii) overload. (2 marks)
- (c) State the effect of each of the following on current in an electric circuit:
- (i) resistance;
- (ii) inductance. (2 marks)
- 3 (a) Give **two** reasons why aluminium is preferred to copper for overhead power line cables. (2 marks)
- (b) In a 12 volt dc system a 40 watt solar panel is exposed to the sun for six hours daily. Calculate the number of days it will take to fully charge a 60 ampere-hour battery. (4 marks)
- 4 (a) Describe the energy conversion sequence in hydro-electric power generation. (2 marks)
- (b) An alloy wire whose diameter is 1.0mm and resistivity is $75 \mu\Omega\text{m}$ is used to make a 150 ohm resistor. Calculate the length of the wire. (5 marks)
- 5 (a) Name any **two** metals used to make alloy magnets. (1 mark)
- (b) Explain how a permanent magnet can be demagnetised electrically. (2 marks)
- 6 (a) Explain why electric power is transmitted at high voltages. (2 marks)
- (b) Explain the **three** functions of a switch gear at a domestic consumer's intake point. (3 marks)

- 7 (a) Name **one** material used to make each of the following parts of electric machines:
- (i) commutator segments;
 - (ii) slip rings;
 - (iii) brushes;
 - (iv) armature core. (2 marks)
- (b) With respect to dc motors, explain the risk involved in each of the following malpractices:
- (i) switching the motor directly to full supply voltage;
 - (ii) running series motor without a load;
 - (iii) operating a shunt motor while its field winding is open. (3 marks)

8 Figure 1 shows PNP transistor whose tab is internally connected to the collector terminal.



Explain how the terminals are identified using an ohmmeter. (3 marks)

- 9 (a) State **three** methods of increasing the sensitivity of a galvanometer. (3 marks)
- (b) An electric pressing iron gets very hot when the temperature control knob is at any position.
- (i) State **two** possible causes of the problem.
 - (ii) List, in correct sequence, the steps taken to identify the fault. (3 marks)
- 10 (a) Explain the difference between “detailed drawing” and exploded drawing. (2 marks)
- (b) Make a free-hand schematic drawing of an electric circuit showing two cells and one normally-open push button switch in series controlling two bells connected in parallel. (5 marks)

SECTION B (48 marks)

Answer any four questions from this section.

- 11 (a) Explain why a series motor develops high torque when subjected to a heavier load. (5 marks)
- (b) A 240v/120v, 1.2KVA transformer delivers power to a load. Calculate the:
- (i) transformation ratio;
 - (ii) rated secondary current;
 - (iii) primary impedance at the rated load;
 - (iv) number of turns in secondary winding if the primary winding induces 0.2v per turn. (7 marks)
- 12 (a) Sketch the voltage-current characteristic curve of a rectifier diode and label:
- (i) the axis;
 - (ii) V_F ;
 - (iii) V_R . (4 marks)
- (b) Figure 2 shows a zener diode regulator circuit.

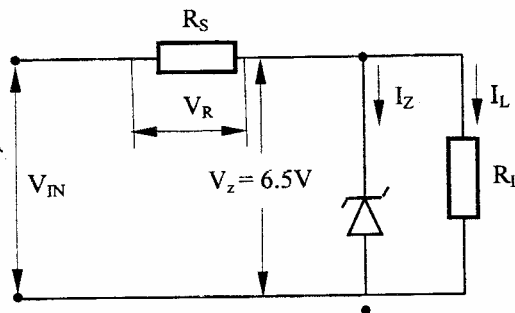


Figure 2

- (i) Calculate the value of:
- I R_S
 - II power dissipated by R_L
- (ii) If V_{IN} is decreased to 11 volts state what changes occur in V_R , I_Z and I_L respectively. (8 marks)

- 13 (a) Explain the term “stroboscopic effect” with respect to discharge lamps. (2 marks)
- (b) (i) Draw a labelled circuit diagram of a starter switch-operated fluorescent lamp.
- (ii) Explain the purpose of each of the following features in the circuit in (b)(i) above.
- I choke
 II fluorescent powder. (10 marks)

- 14 (a) Figure 3 is a resistance network.

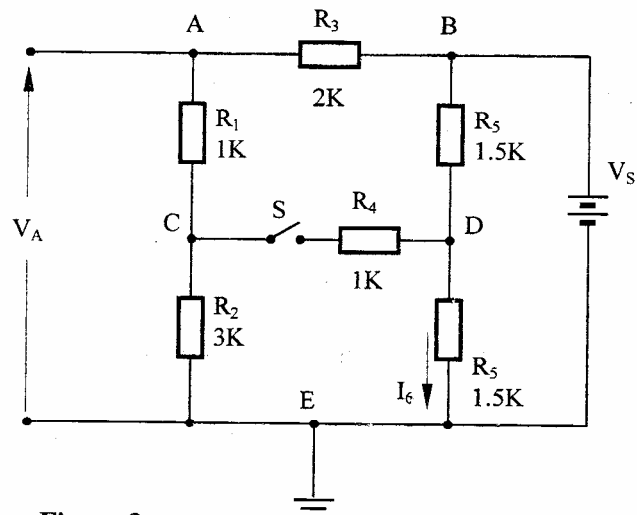


Figure 3

- (i) When S is open, calculate the value of:
- I voltage V_A ;
 II current I_6 .
- (ii) State why no current flows through R_4 when switch S is closed. (6 marks)

- (b) Figure 4 shows an ac RC circuit.

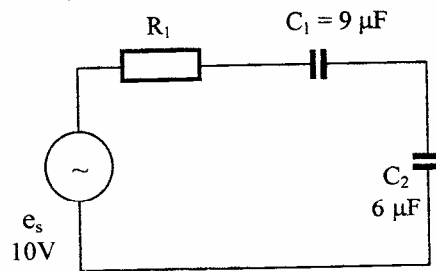


Figure 4

- (i) Calculate the equivalent capacitance in the circuit.
- (ii) If at a frequency f the reactive capacitance of the circuit is $6.0 \text{ K}\Omega$, calculate the magnitude of the current in the circuit. (6 marks)

- 15 Figure 5 shows a Printed Circuit Board (PCB).

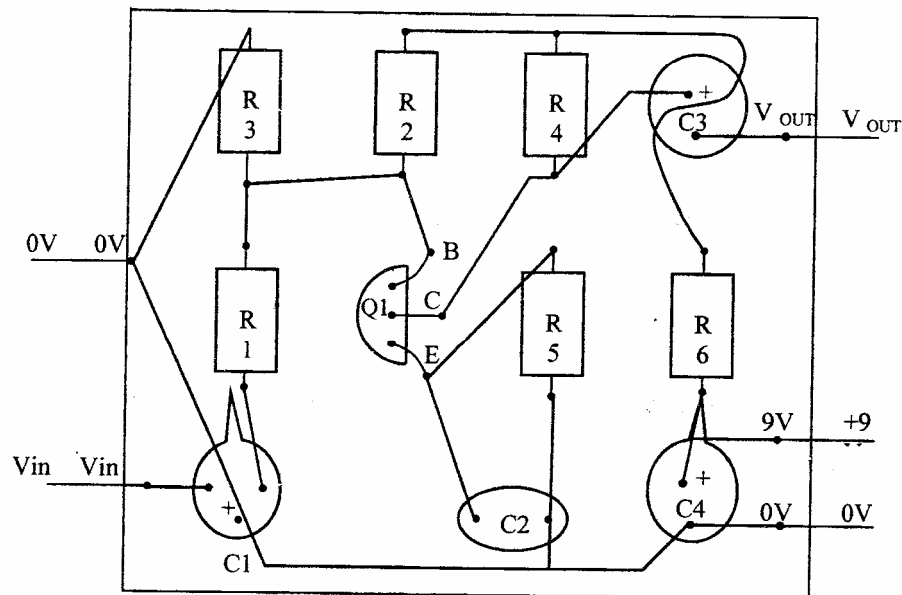


Figure 5

- (a) Outline the procedure of constructing the PCB. (4 marks)
- (b) Given that Q_1 is an NPN transistor, draw the schematic diagram of the circuit on the PCB and label all the components. (8 marks)