

SECTION A

Answer ALL the questions in this Section.

1. (a) Define the following terms with respect to alternating current systems:
- amplitude;
 - cycle. (4 marks)
- (b) With the aid of a diagram and waveform, explain the principle of generation of single phase alternating voltage. (8 marks)
- (c) An a.c. voltage of 50 Hz frequency has a peak value of 100 V.
- Obtain the expressions for the instantaneous values of:
 - voltage;
 - current having a maximum value of 10 A and lagging the voltage by 45° .
 - Determine the average and RMS values of the voltage. (8 marks)

2. (a) **Figure 1** shows a circuit diagram of a moving coil d.c. ammeter where;

R_s = low resistance shunt.

I_s = current flowing through the shunt.

R_a = armature resistance of the ammeter.

I = supply current.

Show that the current multiplying factor is given by $\frac{I_a}{I} = \left(\frac{R_s}{R_a} + 1\right)$ (4 marks)

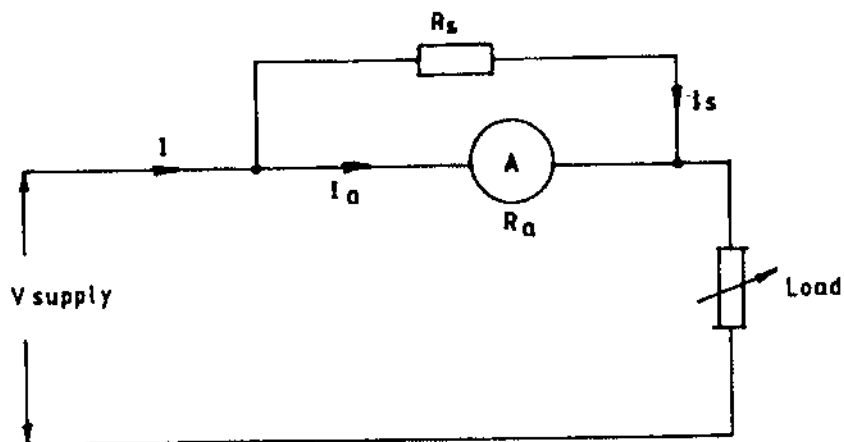


Fig. 1

- (b) State any **three** advantages of potentiometers over voltmeters when used in voltage measurement. (3 marks)

- (c) A wheatstone bridge with terminals A, B, C and D has a galvanometer connected between A and C and a battery between B and D. A resistor of unknown value is connected between A and B. When the bridge is balanced, the resistance between B and C is $100\ \Omega$, C and D is $10\ \Omega$ and between D and A is $400\ \Omega$.
- (i) draw the circuit diagram of the bridge;
 - (ii) determine the value of the unknown resistance;
 - (iii) state **one** assumption made in c (ii). (13 marks)
3. (a) Describe the **three** system buses of an intel 8085 microprocessor. (6 marks)
- (b) An engineering design company intends to open an office at Konza city. State any **four** parameters to be considered while purchasing the computers for the company. (4 marks)
- (c) Write assembly language program segment that performs the following:
add two hexadecimal numbers 25 H and 43 H;
store the result in memory location 2050 H;
subtract two hexadecimal numbers 43 H from 78 H;
store the result in location 2040 H. (10 marks)
4. (a) Distinguish between the following when used with respect to electrical maintenance:
- (i) Gantt chart and bar chart;
 - (ii) preventive and corrective maintenance. (4 marks)
- (b) (i) Explain any **three** factors to be considered in a preventive maintenance program;
- (ii) Explain any **two** personal safety precautions to be observed in an electrical workshop. (10 marks)
- (c) State any **one** cause and a remedy for each of the following faults in a high pressure mercury vapour lamp.
- (i) lamp fails to re-ignite after cooling;
 - (ii) lamp delivers poor light output;
 - (iii) lamp flickers. (6 marks)

SECTION B

Answer **ONE** question from this Section.

5. (a) State any **three** advantages of the three phase over single phase systems. (3 marks)
- (b) A three phase 400 V motor consumes an input power of 40 kW at 0.45 pf lag. Determine the reading of each of the two single phase wattmeters connected to measure the input power. (7 marks)
- (c) A series circuit consists of a resistance of 20 Ω and inductance of 0.05 H, supplied from 230 V, 50 Hz. Determine the:
- (i) current flowing through the circuit;
 - (ii) power factor;
 - (iii) power consumed by the circuit. (10 marks)
6. (a) State **three** causes of each of the following symptoms in a d.c. machine:
- (i) low speed;
 - (ii) fuse blowing off at starting. (6 marks)
- (b) The inspection of electrical machinery falls into two categories; mechanical and electrical. List any **five** of the mechanical inspection checks. (5 marks)
- (c) Describe each for the following instruments used for "supply-off" checks during repair and maintenance of a.c. machines:
- (i) insulation tester;
 - (ii) continuity tester;
 - (iii) feeler gauge. (9 marks)
7. (a) Differentiate between each of the following with respect to computer systems:
- (i) bit and byte;
 - (ii) software and hardware. (4 marks)

(b) **Table 1** shows some of the intel 8085 microprocessor registers. For each, state their:

(i) size (bits);

(ii) function(s).

(9 marks)

Table 1

1.	SP
2.	A
3.	HL

(c) A hard disk drive has 12 sides for recording, 80 tracks per side, 25 sectors per track and 512 bytes per sector. The disk rotates at 1200 r.p.m. Determine the:

(i) packing density in bits/inch for a track located 2 inches from the centre;

(ii) data transfer rate in kilobits/second.

(7 marks)

8. (a) **Figure 2** shows a series connected L-R circuit. Derive an expression from the instantaneous voltage V .

(5 marks)

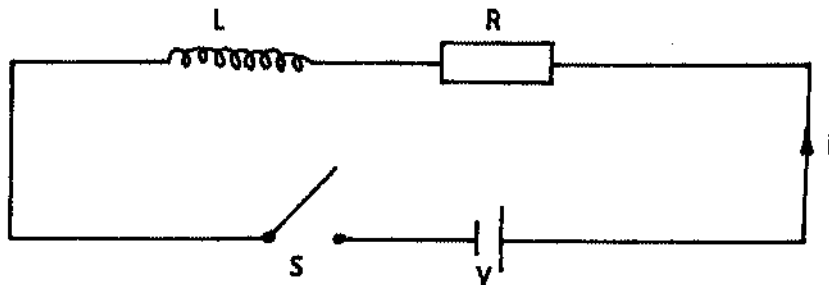


Fig. 2

(b) A capacitor is charged to 100 V and then discharged through a 50 k Ω resistor. If the time constant of the circuit is 0.8 seconds, determine the:

(i) value of the capacitor;

(ii) time for the capacitor voltage to fall to 20 V;

(iii) current flowing when the capacitor has been discharging for 0.5 seconds.

(8 marks)

(c) Draw a labelled no-load phasor diagram of a transformer.

(7 marks)