SECTION- I (ELECTRICAL)
Answer All Questions

PART - A  \( (3 \times 2 = 6) \)

i. State Kirchhoff's Laws.
ii. Write the relationship between line and phase voltages values of star connection.
iii. Define form factor.

PART- B  \( (3 \times 8 = 24) \)

1. A choke coil takes a current of 2.5A when connected across 250 V mains and consumes 400 W. Find (a) the power factor (b) Resistance of the coil (c) Inductance of the coil (d) Apparent power (e) Reactive power.

\( (OR) \)

2. Find the equivalent resistance between B and C.

\[ \text{Diagram of the circuit with resistances labeled.} \]

3. For the circuit shown below, calculate (i) the total equivalent resistance at AB  (ii) the supply current \( I_s \)  (iii) the load current  (iv) the load power.

\[ \text{Diagram of the circuit with resistances labeled and RL = 12Ω.} \]
4. Obtain the form factor and peak factor of pure sinusoidal waveform.

5. Explain the construction and operation of a DC machine.

(OR)

6. Explain the principle of Transformer with neat illustration.

SECTION- II (ELECTRONICS)

Answer All Questions

PART – A (3X2=6)

i. A 5V battery is connected across two diodes connected in series opposing. Find the voltage drop across each diode at room temperature.

ii. Draw the electromagnetic spectrum and label the different types of communication for different frequency ranges.

iii. Differentiate: WiFi and WiMax Networks.

PART – B (3X8=24)

1. (a) A 25 g p-type Ge crystal exhibits a resistivity of 5.0 Ω-cm at 300°K. By uniform antimony doping, it is converted into n-type semiconductor having 1 Ω-cm resistivity at 300°K. If each atom of the initial acceptor impurity is exactly neutralized by one atom of antimony, find in micrograms the amount of antimony required.

OR

2. (b) Draw and elucidate the truth tables and circuit diagrams of half subtractor and full subtractor.

3. (a) A signal $v_m(t)$ is band limited to the frequency range 0 to $f_M$. It is frequency-translated by multiplying it by the signal $v_c(t) = \cos 2\pi f_c t$. Find $f_c$ so that the bandwidth of the translated signal is 1 percent of the frequency $f_c$.

OR

4. (b) Examine the effectiveness of the working procedure in cellular mobile communication.

5. (a) Develop a treatise on the evolution of mobile communication generations.

OR

6. (b) Critically examine the following:

   (i) Internet of Things (IoT)

   (ii) RFID