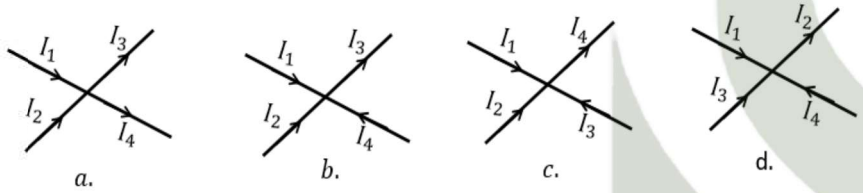
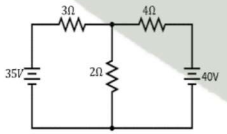
Electrical Circuits (Assignment)

Day - 1 & 2

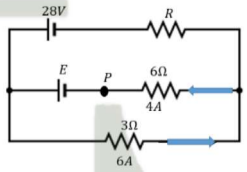
1. The Kirchhoff's first law ($\sum I = 0$, at a junction), where the symbols have their usual meanings, is based on
   a. conservation of momentum b. conservation of charge
   c. conservation of potential d. conservation of energy
2. In Which one of the following diagrams the currents are related by the equation, $I_1 - I_2 = I_3 - I_4$



3. The Kirchhoff's second law ($\sum E = \sum IR$), where the symbols have their usual meanings, is based on
   a. conservation of momentum b. conservation of charge
   c. conservation of potential d. conservation of energy
4. Kirchhoff's law in electricity is very useful in solving the complicated circuit connections,
   a) What are the two basic Kirchhoff's laws?
   b) Using Kirchhoff's law of current and voltage, find the current through 2Ω resistor in the given circuit.

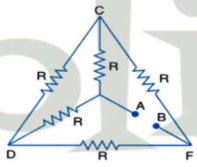


5. Kirchhoff's laws are used in solving complex electrical circuit.
   a) Kirchhoff's laws are applicable to DC circuit. Is it applicable to AC circuit?
   b) Using Kirchhoff's law in electrical circuits, find,
      i. The current in resistor R
      ii. The unknown emf E
      iii. The resistance R
      iv. If the circuit is broken at P, what is the current in resistor R. [Ans: 2A, 42V, 5 Ω, 3.5A]



Day-3

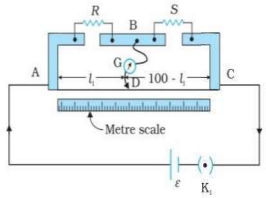
1. In a Wheatstone bridge, all the four arms have equal resistance R. If the resistance of the galvanometer arm is also R, the equivalent resistance of the combination as seen by battery is,
   a. R b. $2R$ c. $R/2$ d. $R/4$
2. Find the equivalent resistance between A and B
   a. R
   b. $2R$
   c. $R/2$
   d. $\frac{R}{4}$



3. Wheatstone bridge is a good engineering of circuit designing. It has several uses and sometimes it shows problems in measuring resistance.
   a) Using Kirchhoff's laws in electrical circuit: derive an expression for the balanced condition of wheat stone bridge
   b) Can we measure internal resistance of a car battery with help of Wheatstone bridge?
   c) Under what condition, Wheatstone bridge work perfectly.

Day-4

1. In meter bridge experiment, the ratio of the left gap resistance to right gap resistance is $2:3$, the balance point from the left is
   a. $60cm$ b. $50cm$ c. $40cm$ d. $30cm$
2. When a metal conductor connected to left gap of a meter bridge is heated, the balancing point
   a. shifts towards right b. shifts towards left
   c. remains unchanged d. remains at zero
3. Meter Bridge is usually used to determine the resistance of a wire segment and the comparison of two resistors.
   a) On what principle does it work?
   b) In a meter bridge when the resistance in the left gap is 3Ω and an unknown resistance in the right gap, the balance point is obtained at 40 cm from the zero end. Find the value of unknown resistance. On shunting the unknown resistance with 2Ω, find the shift of the balance point on the bridge wire.
   c) What happens if the meter bridge wire is made with copper wire?



4. a) In a meter bridge, the balance point is found to be at 39.5 cm from the end A, when the resistor S is of 12.5 Ω. Determine the resistance of R. Why are the connections between resistors in a Wheatstone or meter bridge made of thick copper strips?
   b) Determine the balance point of the bridge above if R and S are interchanged.
   c) What happens if the galvanometer and cell are interchanged at the balance point of the bridge?
5. Meter bridge is based on principle of Wheatstone bridge.
   a) In the meter bridge experiment, the balance point was observed at J with $l = 20cm$.
   (i) The values of R and X were doubled and then interchanged. What would be new position of balance point?
   (ii) If the galvanometer and battery are interchanged at the balance position, how will the balance point get affected?
   b) In Meter Bridge shown below, the null point is found at a distance of 60.0 cm from A. If now a resistance of 5Ω is connected in series with S, the null point occurs at 50 cm. Determine the values of R and S.