Current Electricity

1. Arrive at the expression for electric current in terms of drift velocity. (3)
2. Derive the expression for current density in terms of electric field and conductivity of the material using ohm's law. (3)
3. Obtain the expression for effective resistance of two resistors in series. (3)
4. What is the principle of Meter Bridge? Arrive at the expression for the (unknown) resistance using Meter Bridge. (3)
5. Assuming the expression for current in terms of drift velocity, deduce Ohm's law. (5)
6. What is meant by equivalent resistance? Derive expression for equivalent resistance of two resistors connected in parallel. (5)
7. Discuss the grouping of two cells in series and find their equivalent emf and internal resistance.(5)
8. Obtain the expression for the equivalent emf and internal resistance of two cells connected in parallel. (5)
9. Deduce the condition for balance of Wheat stone's network using Kirchhoff's laws. (5)

1. A copper wire has a diameter of 0.5 mm and resistivity of 1.68 10^{-8} Ωm. What will be the length of this wire to make its resistance of 2 ohm?
2. A grinder motor is designed to operate at a current of 5 A and at a p.d. of 200 V. What resistance must be connected in series with the motor so as to maintain the rated current when it is operated on a 220 V line?
3. A coil of wire has a resistance of 18 Ω at 10^0C and 18.48 Ω at 23^0C. Find the temperature coefficient of resistance. What is the resistance at 0^0C.
4. How do you arrange 45 cells, each of emf 1.4 V and internal resistance 0.1 Ω so as to send maximum current through an external resistance of 0.5 Ω. What is the maximum current?
5. A battery of 6V gives a current of 2 A when connected to a resistance of 2 Ω. What is the internal resistance, terminal p.d. and lost voltage of the battery? Explain the term lost voltage.
6. Two resistors 3 Ω and 6 Ω are connected in parallel. A cell of emf 2 V and internal resistance 1 Ω and a resistor of 7 Ω are connected to the resistor combination. What is the power dissipated across 7 Ω resistor?
7. Two resistances 100 Ω and 200 Ω are connected in series to a 150 V supply. A voltmeter of resistance 200 Ω is connected across 100 Ω resistor. What is the reading of voltmeter?

8. 17. Three bulbs are rated 40 W- 220 V, 60 W- 220 V and 100 W- 220 V respectively. (i) Find the resistance of each bulb. (ii) What is the maximum permissible current in each bulb?
9. Two resistors of 2 Ω and 3 Ω are connected to the left gap of a metre bridge in turn. A standard resistance of 4 Ω is connected to the right gap. Find the balancing lengths in each case.
10. Two cells rated as 10 V, 2 Ω and 8 V, 1Ω are connected in parallel to send current in the same direction across a 6 Ω resistor. Find the p.d. across 6 Ω resistor.
11. In a typical Wheatstone network, resistances P, Q, R and S are 10 Ω, 20 Ω, 30 Ω and 50 Ω respectively. Is the network balanced? If not, how do you vary (i) the arm R and (ii) the arm S to balance the network?
12. A battery of internal resistance 3Ω is connected to 20Ω resistor and the potential difference across the resistor is 10V. If another resistor 30 Ω is connected in series with the first resistor and battery is again connected to the combination then calculate the e.m.f and terminal potential difference across the combination.
13. Two cells of emf 2V and 4Vand internal resistance 1 Ω and 2 Ω respectively are connected in parallel so as to send the current in the same direction through an external resistance of 10. Find the potential difference across 10 Ω resistors.
14. When two resistors are connected in series with a cell of emf 2V of negligible internal resistance, a current of 2/5A flows in circuit. When the resistors are connected in parallel the main current 5/3 A. Calculate the resistance.