UNIT- II- CURRENT ELECTRICITY

Important Formulae

1 Electric current = $\frac{Charge}{Time}$ or I = $\frac{q}{t} = \frac{ne}{t}$

2. In case of an electron revolving in a circle of radius r with speed v, period of revolution is T = $\frac{2\pi r}{v}$

Frequency of revolution, v = $\frac{1}{T} = \frac{v}{2\pi r}$, Current, I = ev = $\frac{ev}{2\pi r}$

3. Ohm's law, R = $\frac{v}{I}$ or V = IR

4. Current in terms of drift velocity (V_d) is I = enAv_d

5. Resistance of a uniform conductor, R = $\rho \frac{I}{A} = \frac{mI}{ne^2\tau A}$

6. Resistivity or specific resistance, $\rho = \frac{RA}{I} = \frac{m}{ne^2\tau}$

7. Conductance = $\frac{1}{R}$

8. Conductivity = $\frac{1}{Resistivity}$ or σ = $\frac{1}{\rho} = \frac{l}{RA}$

9. Current density = $\frac{Current}{Area}$ or j = $\frac{I}{A}$ = env_d

10. Relation between current density and electric field,

j = σ E or E = ρ j

11. Mobility μ = $\frac{V_d}{E}$

12. Temperature coefficient of resistance, α = $\frac{R_2 - R_1}{R_1(t_2 - t_1)}$

13. The equivalent resistance R_s of a number of resistances connected in series is given by

$$R_s = R_1 + R_2 + R_3 + \ldots..$$

14. The equivalent resistance R_p of a number of resistances connected in parallel is given by

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots.$$

15. EMF of a cell, E = $\frac{W}{q}$

16. For a cell of internal resistance r, the emf is E = V + Ir = I (R + r)

17. Terminal p.d of a cell, V = IR = $\frac{E\,R}{R+r}$

18. Terminal p.d. when a current is being drawn from the cell, V = E – Ir

19. Terminal p.d. when the cell is being charged, V = E + Ir

20. Internal resistance of a cell, r = R [$\frac{E-V}{V}$]

21. For n cell in series, I = $\frac{nE}{R+nr}$

22. For n cells in parallel, I = $\frac{nE}{nR+r}$

23. Heat produced by electric current, H = I^2Rt joule = $\frac{I^2\mathrm{Rt}}{4.18}$ cal

24. Electric power, P = $\frac{W}{t}$ = VI = I^2R = $\frac{V^2}{R}$

25. Electric energy, W = Pt = VIt = I^2Rt

26. Potential gradient of the potentiometer wire, k = $\frac{V}{I}$

27. For comparing e.m.f.s of two cells, $\frac{E_2}{E_1} = \frac{I_2}{I_1}$

28. For measuring internal resistance of a cell, r = $\frac{I_1 - I_2}{I_2}$ x R

29. For a balanced Wheatstone bridge, $\frac{P}{Q} = \frac{R}{S}$, If X is the unknown resistance $\frac{P}{Q} = \frac{R}{X}$ or X = $\frac{RQ}{P}$