

# Chapter 1

## Typesetting Mathematics in L<sup>A</sup>T<sub>E</sub>X

$$ax + by + c = 1 \tag{1.1}$$

$$X + y \tag{1.2}$$

### 1.1 Simple Equations

$$Y_D = Z_C$$

$$x + y = 1$$

$$ax + by + c = z + 1$$

$$\begin{array}{rcl}
Y_D & = & Z_C \\
x + y & = & 1 \\
ax + by + c & = & z + 1 \\
x^{10^{15}} & = & y^{12}
\end{array}$$

$$\theta$$

$$\beta$$

$$\Omega$$

$$\rho$$

$$\alpha$$

$$\delta$$

$$\Delta$$

$$\chi$$

$$\phi$$

$$\Pi$$

$$\pi$$

$$\gamma$$

$$\Gamma$$

$$\lambda$$

$$l*b$$

$$a.b$$

$$Ohm's law :$$

$$I=\frac{V}{R}$$

Ohm’s law:

$$I=\frac{V}{R}$$

## 1.2 Square Root, Cube Root, fourth root and nth Root

$$\sqrt{[n]x}$$

$$\sqrt[3]{8}$$

$$2$$

$$\frac{1}{2}$$

$$\sqrt{2}, \sqrt[3]{81}, \sqrt[4]{16}, \sqrt[n]{x}$$

Evaluate:

$$\sqrt{2 + \sqrt{2 + \sqrt{2 + \dots}}}$$

### 1.3 Simple Equations

$$ax + by + cz = 0$$

$$\frac{a}{b} = \frac{c}{z}$$

$$\frac{a^x}{y} = b^y \cdot c^x$$

### 1.4 Diode Equations:

$$i_D = I_S (e^{\frac{v_D}{\eta V_T}} - 1) \quad (1.3)$$

$$V_{D2} - V_{D1} = 2.303 \eta V_T \ln\left(\frac{I_{D2}}{I_{D1}}\right) \quad (1.4)$$

$$i_D = I_S \left( e^{\frac{v_D}{\eta V_T}} - 1 \right) \quad (1.5)$$

$$V_{D2} - V_{D1} = 2.303 \eta V_T \ln\left(\frac{I_{D2}}{I_{D1}}\right) \quad (1.6)$$

$$(1.7)$$

# Chapter 2

## Calculus

### 2.1 Differential Equations:

$$\frac{dy}{dx} + 1 = 0 \quad (2.1)$$

$$\frac{d^2y}{dx^2} + \frac{dy}{dx} + 6 = 0 \quad (2.2)$$

$$\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6 = 1 \quad (2.3)$$

$$\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6 = 2e^{ax} \sin bx \quad (2.4)$$

$$\frac{d^3y}{dx^3} + 8\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6 = 2e^{ax} \cos bx \quad (2.5)$$

$$\frac{d^2y}{dx^2} = -\frac{y^3}{x^3} \quad (2.6)$$

$$\sin^2 x + \cos x^2 = 1 \quad (2.7)$$

## 2.2 Integration:

### 2.2.1 Line Integrals:

$$\int \quad (2.8)$$

$$\int f(x)dx \quad (2.9)$$

$$\int_a^b f(x)dx \quad (2.10)$$

$$\int_a^b f(x)dx \quad (2.11)$$

$$\int_{x_1}^{x_2} f(x)dx \quad (2.12)$$

### 2.2.2 Surface Integrals:

$$\iint_S f(x, y)dx dy \quad (2.13)$$

$$\oiint_S f(x, y)dx dy \quad (2.14)$$

$$\int_{x_1}^{x_2} \int_{y_1}^{y_2} f(x, y) dx dy \quad (2.15)$$

### 2.2.3 Volume Integral:

$$\iiint_V f(x, y, z)dx dy dz \quad (2.16)$$

$$\int_{x_1}^{x_2} \int_{y_1}^{y_2} \int_{z_1}^{z_2} f(x, y, z)dx dy dz \quad (2.17)$$

## 2.3 Fourier Integral:

$$f(t) = \frac{1}{2\pi} \int_{-\infty}^{+\infty} F(s)e^{j\omega t} dt \quad (2.18)$$

## 2.4 Fourier Transform:

$$F(s) = \int_{-\infty}^{+\infty} f(t)e^{-j\omega t} dt \quad (2.19)$$

## 2.5 Inverse Laplace Transform:

$$f(t) = \frac{1}{2\pi} \int_{-\infty}^{+\infty} F(s)e^{st} dt \quad (2.20)$$

## 2.6 Laplace Transform:

$$F(s) = \int_{-\infty}^{+\infty} f(t)e^{-st} dt \quad (2.21)$$

## 2.7 Maxwell's Equations:

### 2.7.1 Differential form of Maxwell's Equation:

Differential form of maxwell's equations are categorized as follows:

Gauss law:

$$\vec{\nabla} \cdot \vec{E} = \frac{\rho}{\epsilon_0}$$

$$\vec{\nabla} \cdot \vec{E} = \frac{\rho}{\epsilon_0}$$

$$\vec{\nabla} \cdot \vec{E} = \frac{\rho}{\epsilon_0}$$

$$\vec{a} \cdot \vec{b} = 0$$

$$\vec{a} \times \vec{b} = 0$$

$$\vec{a}$$

Electrical Engineering

Gauss law for magnetism:

$$\vec{\nabla} \cdot \vec{B} = 0$$

Faraday's law of induction:

$$\vec{\nabla} \times \vec{E} = -\frac{dB}{dt}$$

Ampere's Circuital Law:

$$\vec{\nabla} \times \vec{E} = -\mu_0(J + \epsilon_0 \frac{dE}{dt})$$

### 2.7.2 Integral form of Maxwell's Equation

Integram form of Maxwell's equation are categorized as follows:

Gauss Law:

$$\int \vec{E} \cdot \vec{dl} = 0$$

Gauss Law for Magnetism:

$$\int_S \vec{B} \cdot \vec{ds} = 0$$

## 2.8 Typesetting Matrices and Determinants:

$$A = \begin{pmatrix} a & b & c \\ d & e & f \\ g & h & i \end{pmatrix}$$

$$B = \begin{bmatrix} 1 & 2 & 4 \\ 4 & 6 & 9 \\ 5 & 7 & 8 \end{bmatrix}$$

$$C = \left\{ \begin{array}{ccc} \alpha & \beta & \gamma \\ \zeta & \epsilon & \kappa \\ \nabla & \lambda & \hbar \end{array} \right\}$$

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} = B = \begin{bmatrix} x_{11} & x_{12} & x_{13} \\ x_{21} & x_{22} & x_{23} \\ x_{31} & x_{32} & x_{33} \end{bmatrix}$$

$$x + y - z = 5 \tag{2.22}$$

$$x - y + z = 5 \tag{2.23}$$

$$x - z = 0 \tag{2.24}$$

$$\begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$$

$$a_1x + b_1y + c_1z = d_1 \tag{2.25}$$

$$a_2x + b_2y + c_2z = d_2 \tag{2.26}$$

$$a_2x + b_2y + c_2z = d_3 \tag{2.27}$$

## 2.9 Equations involving limits:

$$\lim_{\Delta x \rightarrow 0} \frac{f(x + \delta x) - f(x)}{\Delta x}$$

$$\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$$

## 2.10 Typesetting Boolean Expressions

$$\underline{x + y} = \bar{x}.\bar{y}$$

$$\overline{ABC} + A\overline{BC} + \overline{A}BC$$

## 2.11 Typesetting equations involving summation

$$\sum_{k=0}^{\infty} \frac{(-1)^k}{k+1} = \int_0^1 \frac{dx}{1+x}$$