Unit - I : Advances In Basics Mathematics

1) Find the angle between the lines $y-\sqrt{3}x-5=0$ and $\sqrt{3}y-x+6=0$

2) Find the perpendicular distance of the from the point $(-2,3)$ to the line $2x-y-3=0$

3) Find the distance between parallel lines $3x+4y-3=0$, $6x+8y-1=0$

4) Find the equation of the straight line passing through the point $(-3,-4)$ and parallel to the line $3x+y-31=0$.

5) Reduce the equation $4x-3y+12=0$ into i) slope intercept form, ii) intercept form, iii) normal form

6) Show that $\lim_{x\to 3} \frac{x^2-8x+15}{x^2-9} = \frac{-1}{3}$

7) Show that i) $\lim_{x\to 0} \frac{1-\cos x}{x}$ ii) $\lim_{x\to 0} \frac{\sec x-1}{x^2} = \frac{1}{2}$ iii) $\lim_{x\to 0} \frac{x(e^x-1)}{1-\cos x} = 2$

8) show that i) $\lim_{x\to a} \frac{x\sin a - a\sin x}{x-a} = \sin a - a\cos a$

ii) $\lim_{x\to 0} \frac{1-\cos 2mx}{\sin^2 nx} = \frac{2m^2}{n^2}$

iii) $\lim_{x\to 0} \frac{\sin(a+bx) - \sin(a-bx)}{x} = 2b\cos a$

iv) $\lim_{x\to 0} \frac{\cos ax - \cos bx}{x^2} = \frac{b^2-a^2}{2}$

9) Evaluate i) $\lim_{x\to\infty} \frac{x^2+5x+2}{2x^2-5x+1}$ ii) $\lim_{x\to\infty} \frac{x^2-3x+4}{13x^3-5x^2-7}$ iii) $\lim_{x\to\infty} \frac{3x^2+4x+5}{2x^3-3x-7}$

10) Find the derivative of i) xe^x ii) $e^x \sec x$ iii) $\tan x \log x$

11) Find $\frac{dy}{dx}$ if $y = \sqrt{1+\sin 2x}$

12) Evaluate i) $\int \frac{x^2+5x+5}{x^4}\,dx$ ii) $\int \frac{(x+2)(x+3)}{\sqrt{x}}\,dx$

iii) $\int (\tan x + 2\cot x)^2\,dx$.

13) Find $\int \left(e^{-2x} + \sin 3x - \frac{1}{x} + a^x\right) dx$

14) Find i) $\int \frac{dx}{\sin^2 x \cos^2 x}$ ii) $\int \frac{dx}{1-\sin x}$ iii) $\int \frac{dx}{1-\cos x}$ iv) $\int \frac{1-\sin x}{1+\sin x} dx$

15) If $\theta - \psi = \frac{\pi}{2}$, then show that

$$\begin{bmatrix} \cos^2\theta & \cos\theta\sin\theta \\ \cos\theta\sin\theta & \sin^2\theta \end{bmatrix} \begin{bmatrix} \cos^2\psi & \cos\psi\sin\psi \\ \cos\psi\sin\psi & \sin^2\psi \end{bmatrix} = 0$$

16) If $A = \begin{bmatrix} 1 & -2 & 1 \\ 0 & 1 & -1 \\ 3 & -1 & 1 \end{bmatrix}$ then find $A^3 - 3A^2 - A3I$.

17) If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ then show that $AA^T = A^TA = I$.

18) show that $\begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix} = (a-b)(b-c)(c-a)(ab+bc+ca)$

19) show that $\begin{vmatrix} a+b+2c & a & b \\ b & b+c+2a & a \\ a & b & c+a+2b \end{vmatrix} = 2(a+b+c)^3$

Unit - II : Advances In Physics

1) Discuss about advances in physics
2) Discuss about Renewable Energy.
3) Discuss about Renewable Energy storage.
4) Discuss about Renewable Energy efficient materials.
5) Discuss about Renewable Energy Devices.
6) Discuss about Recent advances in the Field of Nano Technology.
7) Discuss about Quantum Dots.
8) Discuss about Quantum Communication.
9) Discuss about Recent advances in Biophysics.
10) Discuss about shape Memory Materials.

Unit - III : Advances In chemistry

1) Discuss about advances in chemistry.
2) Discuss about Computer Aided Drug Design and Delivery.
3) Discuss about Nano Sensors.
4) Discuss about chemical Biology.
5) Discuss about Impact of chemical Pollutants on Ecasystems.
6) Discuss about Impact of chemical Pollutants on Human Health.
7) Discuss about Dye Removal.
8) Discuss about Catalysis method in Dye Removal.

Unit - IV : Advances Applications of Mathematics, Physics & Chemistry

1) Discuss about Mathematical Modelling Applications in Physics.
2) Discuss about Mathematical Modelling Applications in chemistry.
3) Discuss about Grid Integration in Renewable Energy
4) Discuss about Smart Grids in Renewable Energy.
5) Discuss about Applications of Nano Technology.
6) Discuss about Bio Mechanics.
7) Discuss about Neuro Physics.
8) Discuss about Radiation Therapy.
9) Discuss about Nuclear Medicine.
10) Discuss about i) Solid Waste Management ii) Water Treatment iii) Green Technology iv) Environmental Remediation.

Unit - V : Advanced Applications of Computer Science

1) Discuss about Number Systems.
2) Discuss about Analog and Digital Signals.
3) Discuss about Modem
4) Discuss about i) Codec ii) Multiplexing
5) Discuss about Transmission Media
6) Discuss about Error detection and Correction.
7) Discuss about Parity check and CRC.
8) Discuss about Network Devices.
9) Discuss about Repeater and Hub.
10) Discuss about Bridge and Switch.