# Vidyalankar School of Information Technology
## SYBSc IT Semester III
## Subject: Applied Mathematics
## Faculty Members: Prof. Sabir Shaikh and Prof. Rahul S. Sonar
## **Remedial Questions**

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| Unit – I | |
| 1 | Let $A = \begin{bmatrix} 2 & -1 & 3 \\ 1 & 1 & 1 \\ 1 & -1 & 1 \end{bmatrix}$, Find $A^{-1}$. |
| 2 | Verify Cayley Hamilton Theorem for the Matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$. |
| 3 | If $A = \frac{1}{3}\begin{bmatrix} 2+i & 2i \\ 2i & 2-i \end{bmatrix}$. Is $A$ a Unitary matrix? |
| 4 | Simplify: $\frac{(Cos\,\theta - i\,Sin\,\theta)^6 (Cos\,5\theta - i\,Sin\,5\theta)^{-2}}{(Cos\;8\theta + i\,Sin\,8\theta)^{1/2}}$ |
| 5 | If $z_1 = 1 - i$ and $z_2 = 1 + i$. Find $z_1 + z_2, z_1 z_2, \frac{z_1}{z_2}$. |
| 6 | Evaluate: $(1+i)^8 + (1-i)^8$ |
| 7 | Express $z = 1 - \sqrt{3}i$ in polar and Exponential form. |
| 8 | Express $z = \frac{1+4i}{4-i}$ in $a + bi$ form |
| Unit – II | |
| 1 | Solve: $(x+1)\frac{dy}{dx} + 1 = 2e^{-y}$ |
| 2 | Solve: $x\,dy = y\,dx$ |
| 3 | Solve: $2xy\,dx + (y^2 - x^2)dy = 0$ |
| 4 | Solve: $(Sin\,x\,Cos\,y + e^{2x})dx + (Cos\,x\,Sin\,y + \tan y)\,dy = 0$ |
| 5 | Solve: $\frac{dy}{dx} + \frac{2xy}{x^2+1} = \frac{4x^2}{x^2+1}$ |
| 6 | Solve: $\frac{dy}{dx} + \frac{2xy}{x^2+1} = \frac{8x}{(x^2+1)^2}$ |
| 7 | Solve: $\frac{d^2y}{dx^2} + 4y = Sin\,3x$ |
| 8 | Solve: $\frac{dy}{dx} = \frac{7x-3y-7}{7y-3x+3}$ |
| Unit – III | |
| 1 | Define Laplace Transform for the function $f(t)$. Using Definition Find $L[Sin\,at]$ |
| 2 | Find $L[1 - t^2 + 4\sin t]$. |
| 3 | Find $L[6t^4 + 3\sinh t - \cosh 2t + e^t]$. |
| 4 | Find Laplace Transform of $e^{-3t}(2\cos 7t + 3\sinh 5t)$. |
| 5 | Using change of scale property, find $L[e^{4t}\sin 4t]$ |
| 6 | Find $L[\int_0^t t\,e^{-3t} Sin\,t\,dt]$. |

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| 7 | Find $L^{-1}\left[\frac{s}{s^2-2s+2}\right]$. |
| 8 | Verify Convolution theorem for $f(t) = 1$ and $g(t) = t$ |
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| Unit – IV | |
| 1 | Evaluate $\int_0^1 \int_0^2 4\, dydx$. |
| 2 | Evaluate $\int_0^1 \int_0^1 (xy)^4\, dy\, dx$ |
| 3 | Evaluate $\int_0^2 \int_0^{\sqrt{2x}} xy\, dydx$. |
| 4 | Change the order of integration and evaluate it $\int_0^2 \int_y^2 (x+1)\, dx\, dy$. |
| 5 | Find by double integration the area bounded by $y^2 = 3x$ and $x^2 = 3y$. |
| 6 | Evaluate $\int_0^1 \int_0^4 \int_2^4 z\, dz\, dy\, dx$. |
| 7 | Evaluate $\int_0^2 \int_0^z \int_{x-z}^{x+z} (x+y+z)\, dy\, dx\, dz$. |
| 8 | Evaluate $\int_0^2 \int_1^2 \int_0^1 y\ dx\, dy\, dz$. |
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| Unit – V | |
| 1 | Define Gamma Function and Prove $\Gamma(n+1) = n\,\Gamma(n)$ |
| 2 | Prove that : $\text{erf}(x) + erf_c(x) = 1$ |
| 3 | Evaluate $2\Gamma\left(\frac{7}{2}\right)$ |
| 4 | Evaluate $3\Gamma\left(\frac{9}{4}\right)$ |
| 5 | Evaluate $\Gamma(4)$ |
| 6 | Show that $\int_0^1 \sqrt{1-x^4}dx = \frac{\sqrt{\pi}}{6} \cdot \frac{\Gamma\left(\frac{1}{4}\right)}{\Gamma\left(\frac{3}{4}\right)}$ |
| 7 | Evaluate : $\int_0^\infty x^7 e^{-2x^4}\, dx$ |
| 8 | Evaluate : $\int_0^\infty x^{-4} e^{-\frac{1}{x}} dx$ |

Signature of Faculty Members

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