

[Time:2.30 Hrs]		[Marks:75]
Please check whether you have got the right question paper.		
N.B:	1. All question are compulsory. 2. Figures to the right indicate full marks. 3. Students answering in the regional language should refer in case of doubt to the main text of the paper in English.	

Q.1	<p>Attempt any three of the following</p> <p>a. Given that $A = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$. Find: $A^2 - 4A + 5I$, where $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ is an identity matrix.</p> <p>b. Show that the matrix B is Skew-Hermitian : $B = \begin{bmatrix} 3i & 2+i \\ -2+i & -i \end{bmatrix}$</p> <p>c. Find the inverse of $A = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$.</p> <p>d. Verify Cayley-Hamilton theorem for $A = \begin{bmatrix} 5 & 3 \\ 1 & 3 \end{bmatrix}$.</p> <p>e. Find the Eigen value of $A = \begin{bmatrix} 1 & 3 & 0 \\ 3 & -2 & -1 \\ 0 & -1 & 1 \end{bmatrix}$.</p> <p>f. Express $z = \frac{3+i}{5+5i}$ in $a + bi$ form.</p>	15
Q.2	<p>Attempt any three of the following</p> <p>a. Solve: $(x+1)\frac{dy}{dx} + 1 = 2e^{-y}$</p> <p>b. Solve: $(4x+3y+6)dx - (3x+y+7)dy = 0$</p> <p>c. Solve: $(x^3 + y^3)\frac{dy}{dx} = x^2y$</p> <p>d. Solve: $\frac{dy}{dx} + \frac{2xy}{x^2+1} = \frac{4x^2}{x^2+1}$</p>	15

	<p>e. Solve: $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = e^{4x}$</p> <p>f. Solve: $(x^2 + y^2) dx + 2xy dy = 0$.</p>	
Q.3	<p>Attempt any three of the following</p> <p>a. Find $L^{-1} \left[\frac{s}{s^2 - 2s + 2} \right]$.</p> <p>b. Find $L[e^{2t} \cos 2t]$.</p> <p>c. Define Laplace Transform. Find $L[\cos 3t]$.</p> <p>d. find $L[e^{4t} \sin 4t]$.</p> <p>e. Find $L^{-1} \left[\frac{1}{s-2} \right]$.</p> <p>f. Find Laplace Transform of $(2 \cos 3t + \sin 5t)$.</p>	15
Q.4	<p>Attempt any three of the following</p> <p>a. Find the area bounded by $y^2 = 4x$ and $x^2 = 4y$, using double integration.</p> <p>b. Evaluate $\int_0^1 \int_0^1 x^2 y^1 dy dx$.</p> <p>c. Evaluate $\int_0^3 \int_0^2 \int_0^1 xyz dx dy dz$.</p> <p>d. Change the order of integration and evaluate it $\int_0^1 \int_y^1 (x+4) dx dy$.</p> <p>e. Evaluate $\int_0^2 \int_0^3 xy dy dx$.</p> <p>f. Find the area bounded by $y^2 = x$ and $x^2 = y$, using double integration</p>	15
Q.5	<p>Attempt any three of the following</p> <p>a. Prove that $\operatorname{erf}(x)$ is an odd function.</p> <p>b. Prove that: $\operatorname{erf}(x) + \operatorname{erfc}(x) = 1$.</p> <p>c. Find: $\gamma(4)$</p>	15

		<p>d. Find: $\Gamma\left(\frac{3}{2}\right)$</p> <p>e. Compute $\beta(2.5, 1.5)$.</p> <p>f. Define Beta Function and gamma function with formula.</p>	
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