GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–III (OLD) EXAMINATION – SUMMER 2024

Subject Code:130002   **Date:11-07-2024**
Subject Name:Advanced Engineering Mathematics
Time:10:30 AM TO 01:30 PM   **Total Marks:70**
Instructions:
   1. **Attempt all questions.**
   2. **Make suitable assumptions wherever necessary.**
   3. **Figures to the right indicate full marks.**
   4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	**(a)**	(i) Solve $(x^3 + 3xy^2)dx + (3x^2y + y^3)dy = 0$	04
		(ii) Solve $\frac{dy}{dx} + \frac{1}{x^2}y = 6e^{\frac{1}{x}}$	03
	(b)	(i) Find Laplace transform of $e^{-3t}(2\cos 5t - 3\sin 5t)$, using first shifting theorem.	04
		(ii) Find inverse Laplace transform of $\frac{s+2}{s^2+4s+8}$	03
Q.2	**(a)**	Find Half range cosine series of $f(x) = x^2,\ 0 < x < 1$	07
	(b)	Obtain Fourier series of $f(x) = x + x^2,\ -\pi < x < \pi$.	07
		OR	
	(b)	Find Series solution of $y' - 2xy = 0$	07
Q.3	**(a)**	(i) If x is one solution of $x^2y'' + xy' - y = 0$, find the second solution.	04
		(ii) Solve $(p - q)(z - px - qy) = 1$	03
	(b)	Solve $(D^2 - 2D)y = e^x \sin x$,using method of Undetermined coefficients.	07
		OR	
Q.3	**(a)**	(i) Find the Fourier sine integral of $f(x) = e^{-bx}$.	04
		(ii) Solve $p^2 - q^2 = x - y$.	03
	(b)	Using Power series method, solve $(1 - x^2)y'' - 2xy' + 2y = 0$	07
Q.4	**(a)**	(i) Solve $(D^3 + 1)y = 0$	04
		(ii) Solve $(D^4 - 2D^3 + D^2)y = 0$	03
	(b)	Using method of Variation of parameter, solve $(D^2 + 3D + 2)y = e^{e^x}$	07
		OR	
Q.4	**(a)**	(i) Find inverse Laplace transform of $\log\left(1 + \frac{\omega^2}{s^2}\right)$	04
		(ii) Find Laplace transform of $(\sin 2t)/t$	03
	(b)	Find inverse Laplace transform of $\frac{1}{(s+1)(s^2+1)}$, using Convolution theorem.	07
Q.5	**(a)**	(i) Solve $p^2 + q^2 = 1$	04
		(ii) Define Gamma function and find its value for 3/2.	03
	(b)	Solve $(D^2 + 10DD' + 25D'^2)z = e^{3x+2y}$	07
		OR	
Q.5	**(a)**	(i) Solve $yzp - xzq = xy$.	04
		(ii) Define Dirac's Delta function and Beta function.	03
	(b)	Solve $x\frac{\partial u}{\partial x} - 2y\frac{\partial u}{\partial y} = 0$, using method of separation of variables.	07

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