

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-III (NEW) EXAMINATION – WINTER 2024****Subject Code:2130002****Date:18-12-2024****Subject Name:Advance 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.

		Marks
Q.1	(a) Solve: $x^2 dy + y(x + y)dx = 0$	03
	(b) Find the Laplace transform of $t^2 \sin \pi t$	04
	(c) Find a Fourier series for a periodic function $f(x)$ with period 2, where $f(x) = -1, -1 < x < 0$ $= 1, \quad 0 < x < 1$	07
Q.2	(a) Define Beta function, Gamma function and write the relation between Beta and Gamma function.	03
	(b) Solve: $(x + 1) \frac{dy}{dx} - y = e^{3x}(x + 1)^2$	04
	(c) Find the Fourier series of $f(x) = x + x , \quad -\pi < x < \pi$.	07
	OR	
	(c) Solve $y'' + 4y = 8x^2$ by using the method of undetermined coefficients.	07
Q.3	(a) Laplace Find $L^{-1} \left\{ \frac{s^3 + 2s^2 + 2}{s^3(s^2 + 1)} \right\}$	03
	(b) Find particular integral for an equation $(D^2 - 4D + 3)y = \sin 3x \cos 2x$	04
	(c) Solve the IVP $y'' - 2y' = e^t \sin t, \quad y(0) = y'(0) = 0$	07
	OR	
Q.3	(a) By using first shifting theorem find $L\{(t + 1)^2 e^t\}$	03
	(b) Solve $\frac{d^2y}{dx^2} + 4y = \tan 2x$ by using Variation of Parameter.	04
	(c) Using convolution theorem find the inverse transform of $\frac{a}{s^2(s^2 + a^2)}$	07
Q.4	(a) Solve $\frac{dy}{dx} + \frac{2y}{x} = \sin x$	03
	(b) Find the Laplace Transform of $e^{-2t}(\sin 4t + t^2)$	04
	(c) Find the Power series solution of the equation $(x^2 + 1)y'' + xy' - xy = 0$	07
	OR	
Q.4	(a) (I) Find the Laplace Transform of $\frac{\cos at - \cos bt}{t}$	03
	(II) Find the Laplace transform of $L\{t^2 u(t - 2)\}$	
	(b) Find half-range cosine series for $f(x) = (x - 1)^2, \quad 0 < x < 1$	04
	(c) Find the series solution of $xy'' + y' + xy = 0$	07

Q.5 (a) (I) Find the complete integral of $pq = 4z$ **03**
 (II) Find the complete integral of $p - x^2 = q + y^2$

(b) Form a partial differential equation by eliminating arbitrary constants a and b from **04**
 equation $z = (x^2 + a)(y^2 + b)$

(c) Using Charpti's method solve: $z = pq$ **07**

OR

Q.5 (a) Form a partial differential equation by eliminating arbitrary function from **03**
 $\phi(x^2 - y^2, xyz) = 0$

(b) Solve $x^2p + y^2q = z^2$ **04**

(c) Solve the equation $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$, given $u(x, 0) = 4e^{-4x}$ by using **07**
 Separation of variable method.
