Seat No.: ________ Enrolment No.___________

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (OLD) EXAMINATION – WINTER 2021

Subject Code:130002 Date:15-02-2022

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.**

			MARKS
Q.1	**(a)**	(i) Solve $(x+1)\frac{dy}{dx} - y = e^{3x}(x+1)^2$	**03**
		(ii) Find the half range sine series of $f(x) = e^x$ in $0 < x < \pi$	**04**
	(b)	Find the series solution of $(1+x^2)y'' + xy' - xy = 0$	**07**
Q.2	**(a)**	(i) Solve $\frac{dy}{dx} + \frac{1}{x} = \frac{e^y}{x^2}$	**03**
		(ii) Solve $\frac{d^3y}{dx^3} + \frac{dy}{dx} = cosec x$ by the method of variation of parameter	**04**
	(b)	Solve $\frac{d^3y}{dx^3} + 8y = cosh2x$	**07**
		OR	
	(b)	(i) Find the Laplace transform of $sinh^5 t$.	**03**
		(ii) Find the Inverse Laplace transform of $\frac{3s+7}{s^2-2s-3}$	**04**
Q.3	**(a)**	(i) Define 1. Gamma Function 2. Beta Function 3. Signum Function	**03**
		(ii) Find the Fourier *cosine* series for $f(x) = x^2, 0 < x < c$.	**04**
	(b)	Solve $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = logx.\sin(logx)$	**07**
		OR	
Q.3	**(a)**	(i) Solve $(x+1)\frac{dy}{dx} - y = e^{3x}(x+1)^2$	**03**
		(ii) Solve by using Undetermined Coefficient method $(D^2 - 2D + 3)y = x^3 + sinx$	**04**
	(b)	Find the series solution of $2x(x-1)y'' - (x+1)y' + y = 0; x_0 = 0$	**07**
Q.4	**(a)**	Find the Inverse Laplace transform of $slog(\frac{s^2+a^2}{s^2+b^2})$	**07**
	(b)	Solve $2\frac{\partial u}{\partial x} = \frac{\partial u}{\partial t} + u$ subject to the condition $u(x,0) = 4e^{-3x}$ by method of separation of variables.	**07**
		OR	
Q.4	**(a)**	Solve the initial value problem using Laplace Transform $y'' + 3y' + 2y = e^t, \quad y(0) = 1, y'(0) = 0.$	**07**

(b) (i) Solve $p^2 + q^2 = npq$ **03**

(ii) Solve $pz - qz = z^2 + (x + y)^2$ **04**

Q.5 **(a)** State the convolution theorem and verify it for $f(t) = t$ and $g(t) = e^{2t}$. **07**

(b) Obtain the Fourier series of $f(x) = \left(\frac{\pi - x}{2}\right)^2$ in the interval $0 \le x \le 2\pi$. Hence Deduce that $\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2}$ **07**

OR

Q.5 **(a)** (i) Form a partial differential equation by eliminating the arbitrary functions from $xyz = \emptyset(x + y + z)$ **03**

(ii) Find the Laplace Transform of $f(t) = sinat$ **04**

(b) Find the fourier integral representation of the function **07**

$$f(x) = \begin{cases} 2\ ; & |x| < 2 \\ 0\ ; & |x| > 2 \end{cases}$$

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