Seat No.: ________ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III (New) EXAMINATION – WINTER 2019

Subject Code: 2130002 **Date: 22/11/2019**

Subject Name: Advanced Engineering Mathematics

Time: 02:30 PM TO 05:30 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	Determine the singular points of the differential equation $x(x+1)^2 y''+(2x-1)y'+x^2 y=0$ and classify them as regular or irregular.	**03**
	(b)	(i) Compute $\beta\left(\frac{5}{2},\frac{3}{2}\right)$	**02**
		(ii) Define (1) Error Function (2) Beta Function	**02**
	(c)	(i) Solve the I. V. P : $y''-4y'+4y=0,\ y(0)=3\ \&\ y'(0)=1$	**03**
		(ii) Find (a) $L\left\{e^t(\sin 3t+t^3)\right\}$ (b) $L^{-1}\left\{\frac{6s-7}{s^2+5}\right\}$	**04**
Q.2	**(a)**	Solve $(1+x)y\,dx + (1-y)x\,dy = 0$	**03**
	(b)	Solve $(D^2-5D+6)y=\sin 3x$	**04**
	(c)	State the convolution theorem and apply it to evaluate $L^{-1}\left[\frac{1}{s(s+a)^3}\right]$	**07**
		OR	
	(c)	Using Laplace Transformation, Solve $y''+6y=1,\quad y(0)=2,\ y'(0)=0$	**07**
Q.3	**(a)**	Find the Laplace transform of $f(t)=\begin{cases}0, & 0\le t<2\\ 3, & t\ge 2\end{cases}$	**03**
	(b)	Find the power series solution of $y'=2xy$.	**04**
	(c)	Obtain Fourier series of the Function $f(x)=\begin{cases}0, & -2\le x<0\\ 1, & 0\le x\le 2\end{cases}$	**07**
		OR	
Q.3	**(a)**	Find the Inverse Laplace Transform of $\frac{6e^{-2s}}{(s^2+4)}$	**03**
	(b)	Find the series solution of $y''+x^2y=0$ in power of x.	**04**
	(c)	Obtain Fourier series of the Function $f(x)=x+\lvert x\rvert\ ,\ -\pi<x<\pi$	**07**
Q.4	**(a)**	Solve $\frac{dy}{dx}+y\tan x=\sin 2x$	**03**
	(b)	Find a sine series for $f(x)=e^x$ in $0<x<\pi$.	**04**
	(c)	By the Method of Separation of variables, solve $2\frac{\partial u}{\partial x}=\frac{\partial u}{\partial t}+u$ where $u(x,0)=4e^{-3x}$	**07**
		OR	
Q.4	**(a)**	Solve $y e^x dx+(2y+e^x)\,dy=0,\quad y(0)=-1$	**03**

	(b)	Find a cosine series for $f(x) = x^2$ in $0 < x < \pi$.	**04**
	(c)	Using Undetermined co-efficient method , solve the differential equation $y''+y'-6y = 6x+3x^2-6x^3$	**07**
Q.5	**(a)**	Solve $z = px+qy+p^2q^2$	**03**
	(b)	Find (1) $L\left[\int_0^t e^{-t}\cos u\, du\right]$ (2) $L^{-1}\left[\dfrac{2s+2}{s^2+2s+10}\right]$	**04**
	(c)	Find the general solution of P. D. E : $(x^2-yz)\,p+(y^2-zx)\,q = z^2-xy$	**07**

OR

Q.5	**(a)**	Form a Partial differential equation from $f(xy+z^2, x+y+z) = 0$	**03**
	(b)	Find (1) $L\left[\int_0^t\int_0^t \sin au\, du\, du\right]$ (2) $L^{-1}\left[\dfrac{s+2}{s^2+4s+8}\right]$	**04**
	(c)	Using Method of Variation of parameters, Solve $(D^2-2D+1)y = 3x^{\frac{3}{2}}e^x$	**07**

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