

**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.

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

- (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 **07**  
 $y'' + y' - 6y = 6x + 3x^2 - 6x^3$

- Q.5** (a) Solve  $z = px + qy + p^2 + q^2$  **03**  
 (b) Find (1)  $L\left[\int_0^t e^{-t} \cos u \, du\right]$  (2)  $L^{-1}\left[\frac{2s+2}{s^2+2s+10}\right]$  **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)  $L^{-1}\left[\frac{s+2}{s^2+4s+8}\right]$  **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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