Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III EXAMINATION – SUMMER 2015

Subject Code:130002 **Date:**06/**06/2015**

Subject Name: Advanced Engineering Mathematics

Time: 02.30pm-05.30pm **Total Marks: 70**

Instructions:

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

Q.1	**(a)**	Attempt the following	
	(i)	Solve $[1+e^{x/y}]dx+e^{x/y}[1-\frac{x}{y}]dy=0$	**04**
	(ii)	Solve $\frac{dy}{dx}+\frac{y}{x^2}=6e^{1/x}$	**03**
	(b)	Attempt the following	
	(i)	Solve $(D^3-7D+6)y=e^{2x}$	**04**
	(ii)	Define square wave function and draw its graph	**03**
Q.2	**(a)**	Attempt the following	
	(i)	Solve $(D^2+9)y=\cos 2x+\sin 2x$	**04**
	(ii)	Find the ordinary and singular points of $2x^2y''+6xy'+(x+3)y=0$	**03**
	(b)	Attempt the following	
	(i)	Solve the Cauchy-Euler equation $x^2D^2y-3xDy+5y=x^2\sin(\log x)$	**05**
	(ii)	Define Gamma Function and obtain its value for 7.	**02**
		OR	
	(b)	Find the series solution of $(1+x^2)y''+xy'-9y=0$	**07**
Q.3	**(a)**	Find Fourier series for $f(x)=\begin{cases}\pi x, 0\le x\le 1\\ \pi(2-x), 1\le x\le 2\end{cases}$	**07**
	(b)	Attempt the following	
	(i)	Find Fourier series expansion of $f(x)=\lvert x\rvert, -\pi<x<\pi$	**04**
	(ii)	Find Fourier sine series for $f(x)=\pi x-x^2$ in $(0,\pi)$.	**03**
		OR	
Q.3	**(a)**	Attempt the following	
	(i)	Obtain Fourier series for $f(x)=x-x^2, -1<x<1$.	**04**
	(ii)	Find a cosine series for $f(x)=e^x, 0<x<\pi$.	**03**
	(b)	Obtain Fourier series to represent $f(x)=\left(\frac{\pi-x}{2}\right)^2$ in the interval $0<x<2\pi$.	**07**
Q.4	**(a)**	Attempt the following	
	(i)	Find the inverse Laplace transform of $\frac{4s+5}{(s-1)^2(s+2)}$	**04**
	(ii)	Find the Laplace transform of $e^{4t}\sin 2t\cos t$	**03**
	(b)	Attempt the following	
	(i)	Solve by Laplace transform $y''+6y=1, y(0)=2, y'(0)=0$.	**05**

(ii) Find the convolution of 1*1 **02**

OR

Q.4 **(a)** Attempt the following

(i) Find the inverse Laplace transform of $\frac{2-5s}{(s-6)(s^2+11)}$ **04**

(ii) Find Laplace transform of $t^2 \cosh 3t$. **03**

(b) Attempt the following

(i) Solve by Laplace transform $y' - 4y = 2e^{2t} + e^{4t}$ given that at $t = 0, y = 0$. **05**

(ii) Find Laplace transform of $(t-1)^2 u(t-1)$. **02**

Q.5 **(a)** Attempt the following

(i) Derive partial differential equation by eliminating constants a and b from $z = (x+a)(y+b)$. **03**

(ii) Solve by separation of variables method: $u_x + u_y = 2(x+y)u$. **04**

(b) Use Frobenius method to solve $2x^2 y'' - xy' + (1-x^2)y = 0$. **07**

OR

Q.5 **(a)** Attempt the following

(i) Form the partial differential equation by eliminating the arbitrary functions f and F from the relation $y = f(x-at) + F(x+at)$. **03**

(ii) Find the complete integral of $pq = 4z$. **04**

(b) Express the function $f(x) = \begin{cases} 1 \, for |x| \le 1 \\ 0 \, for |x| \ge 1 \end{cases}$ as a Fourier integral. Hence evaluate $\int_0^\infty \frac{\sin \lambda \cos \lambda x}{\lambda} d\lambda$. **07**

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