Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III(New) EXAMINATION – SUMMER 2016

Subject Code:2130002 Date:07/06/2016

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.**

Q.1 **Answer the following one mark each questions :** **14**

1 Integreating factor of the differential equation $\frac{dx}{dy}+\frac{3x}{y}=\frac{1}{y^2}$ is _____

2 The general solution of the differential equation $\frac{dy}{dx}+\frac{y}{x}$ =tan2x_____.

3 The orthogonal trajectory of the family of curve $x^2+y^2=c^2$ is _____

4 Particular integral of $(D^2+4)y=\cos 2x$ is _____

5 X=0 is a regular singular point of $2x^2y''+3xy'(x^2-4)y=0$ say true or false.

6 The solution of $(y-z)p+(z-x)q=x-\ y\ is$_____

7 State the type ,order and degree of differential equation $(\frac{dx}{dy})^2+5y^{\frac{1}{3}}$ = x is _____

8 Solve (D+D')z= cos x

9 Is the partial differential equation $2\frac{\partial^2 u}{\partial x^2}+4\frac{\partial^2 u}{\partial x\partial y}+\ 3\ \frac{\partial^2 u}{\partial y^2}=6$ elliptic?

10 $L^{-1}\left(\frac{1}{(s+a)^2}\right)=$ _____

11 If f(t) is a periodic function with period t then $L[f(t)]=$ _____

12 Laplace transform of f(t) is defined for +ve and –ve values of t. Say true or false.

13 State Duplication (Legendre) formula.

14 Find B ($\frac{9}{2},\frac{7}{2}$)

Q.2 **(a)** Solve : 9y $y'+4x=0$ **03**

(b) Solve : $\frac{dy}{dx} + y\cot x = 2\cos x$ **04**

(c) Find series solution of $y'' + xy = 0$ **07**

OR

(c) Determine the value of (a) $J_{\frac{1}{2}}(x)$ (b) $J_{\frac{3}{2}}(x)$ **07**

Q.3 **(a)** Solve $(D^2 + 9)y = 2\sin 3x + \cos 3x$ **03**

(b) Solve $y'' + 4y' = 8x^2$ by the method of undetermined coefficients. **04**

(c) (i) Solve $x^2p + y^2q = z^2$ **07**
(ii) Solve by charpit's method px+qy = pq

OR

Q.3 **(a)** Solve $y'' + 4y' + 4 = 0$, $y(0) = 1$, $y'(0) = 1$ **03**

(b) Find the solution of $y'' + a^2y' = \tan ax$, by the method of variation of parameters. **04**

(c) Solve the equation $u_x = 2u_t + u$ given $u(x,0)= 4e^{-4x}$ by the method of separation of variable. **07**

Q.4 **(a)** Find the fourier transform of the function $f(x) = e^{-ax^2}$ **03**

(b) Obtain fourier series to represent $f(x) =x^2$ in the interval $-\pi < x < \pi$ .Deduce that $\sum_{n=1}^{\infty}\frac{1}{n^2} = \frac{\pi^2}{6}$ **04**

(c) Find Half-Range cosine series for **07**

$F(x) = kx \quad , 0 \le x \le \frac{l}{2}$

$= k(l\text{-}x) \quad , \frac{l}{2} \le x \le l$

Also prove that $\sum_{n=1}^{\infty}\frac{1}{(2n-1)^2} = \frac{\pi^2}{8}$

OR

Q.4 **(a)** Expres the function **03**

$F(x)= 2 , |x| < 2$

$= 0 , |x| > 2$ as Fourier integral.

(b) Find the fourier series expansion of the function **04**

$F(x) = -\pi \quad -\pi < x < 0$

$= x \quad 0 < x < \pi$

(c) Find fourier series to represent the function **07**
$F(x) = 2x\text{-}x^2$ in $0 < x < 3$

Q.5 **(a)** $Find \;\; L^{-1}\left\{\frac{1}{(s+\sqrt{2})(s-\sqrt{3})}\right\}$ **03**

(b) Find the laplace transform of **04**

(i) $\frac{cosat-cosbt}{t}$

(ii) tsinat

(c) State convolution theorem and use to it evaluate $L^{-1}\left\{\frac{1}{(s^2+a^2)^2}\right\}$ **07**

OR

Q.5	**(a)**	L $\{t^2 \cos h3t\}$	**03**
	(b)	Find $L^{-1}\left\{\frac{1}{s^4-81}\right\}$	**04**
	(c)	Solve the equation $y'' - 3y' + 2y = 4t + e^{3t}$,when y(0)=1 , $y'(0) = -1$	**07**

****