Enrollment No: ______________________ **Exam Seat No:**______________________

C. U. SHAH UNIVERSITY

Summer Examination-2022

Subject Name: Engineering Mathematics - 3

Subject Code: 4TE03EMT2 **Branch: B.Tech (All)**

Semester: 3 **Date: 21/04/2022** **Time: 02:30 To 05:30** **Marks: 70**

Instructions:

(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1 **Attempt the following questions:** **(14)**

a) If $f(-x) = -f(x)$ then f is

(a) Even function (b) Odd function (c) Both a and b (d)None of these

b) If the function $f(x)$ is even then which of the following is zero?

(a)a_0 (b)a_n (c)b_n (d) Both a and b

c) $L(sin\ at) =$ ____

$(a)\frac{a}{s^2+a^2}$ $(b)\frac{s}{s^2+a^2}$ $(c)\frac{(-s)}{s^2+a^2}$ $(d)\frac{a}{s^2+a^2}$

d) $Find\ the\ L(t^4)$

$(a)\ \frac{24}{s^4}$ $(b)\ \frac{24}{s^5}$ $(c)\ \frac{16}{s^4}$ $(d)\ \frac{16}{s^5}$

e) If $f(D)y = X$ is given linear differential equation then its general solution is____.

(a) $y(x) = C.F + P.I$ (b) Solution of $f(D) = 0$

(c) $y(x) = P.I$ (d) None of these

f) Solution of $(D^2 - 1)y = 0$ is

(a) $y = (c_1 + c_2)e^x$ (b) $(c_1 + c_2x)e^x + (c_1 + c_2x)e^{-x}$

(c) $y = (c_1 + c_2x)e^x$ (d) $y = c_1e^{-x} + c_2e^x$

g) Find the degree of a given differential equation $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right) + y = 0$

(a) 1 (b) 2 (c) 3 (d) 0

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

$(a)\ \frac{1}{a}cosat$ $(b)\ \frac{1}{a^2}sinat$ $(c)\ \frac{1}{a}sinat$ $(d)\ \frac{1}{a^2}cosat$

i) Which of the following is the partial differential equation of $z = ax + by + ab$ by eliminating arbitrary constant.

$(a)z = px + qy + pq$ $(b)z = pz - qy + pq$

$(c)z = px + qy - pq$ $(d)\ z = px - qy - pq$

j) If the differential equation is $\frac{d^2y}{dx^2} - 4y + 4 = 0$

then roots of auxiliary equation ________

$(a)\ m_1 = 1, m_2 = 1$ $(b)\ m_1 = -1, m_2 = -1$

$(c)\ m_1 = 2, m_2 = -2$ $(d)\ m_1 = 2, m_2 = 2$

k) Newton-Raphson algorithm for finding the square root of N is

(a) $x_{n+1} = \frac{1}{2}[x_n + \left(\frac{N}{x_n}\right)]$ (b) $x_{n+1} = \frac{1}{2}[x_n - \left(\frac{N}{x_n}\right)]$

(c) $x_{n+1} = \frac{1}{2}[x_n + \left(\frac{2N}{x_n}\right)]$ (d) $x_{n+1} = \frac{1}{2}[2x_n + \left(\frac{N}{x_n}\right)]$

l) The rate of convergence of Newton–Raphson method is

(a) First order (b) Second order (c) Third order (d) None

m) Which of the following is transcendental equation

$(a)\ x - 2 = 0$ $(b)\ x^2 - 3x + 6 = 0$

$(c)\ xe^x - 2 = 0$ $(d)\ None\ of\ these$

n) The Complementary function of $(D^2 - D'^2)z = 0$ is

$(a)\phi_1(y-x) + \phi_2(y+2x)$ $(b)\phi_1(y-x) + \emptyset_2(y+x)$

$(c)\ \phi_1(y-2x) + \phi_2(y+x)$ $(d)\ \phi_1(y-2x) + \phi_2(y+2x)$

Attempt any four questions from Q-2 to Q-8

Q-2		**Attempt all questions**	**(14)**
	a)	Find the root of the equation $x^3 - 2x - 5 = 0$ by method of false position correct to three decimal places	**(05)**
	b)	Find the root of the equation $x^3 - x - 11 = 0$ correct to three decimal using bisection method.	**(05)**
	c)	Evaluate $\sqrt{15}$ correct to three decimal places using Newton-Raphson method.	**(04)**
Q-3		**Attempt all questions**	**(14)**
	a)	Expand $f(x) = x\sin x$ in a Fourier series in the interval $0 \le x \le 2\pi$.	**(07)**
	b)	Express $f(x) = e^{ax}$ as a Fourier series in the interval $-\pi < x < \pi$.	**(05)**
	c)	Write down general form of linear differential equation in higher order.	**(02)**
Q-4		**Attempt all questions**	**(14)**
	a)	Find $L\left(\frac{\cos 2t - \cos 3t}{t}\right)$	**(05)**
	b)	Find $L(t \cdot e^{2t}\cos 3t)$	**(05)**
	c)	Find $L(e^{4t}\sin 2t\cos t)$	**(04)**
Q-5		**Attempt all questions**	**(14)**
	a)	Solve the equation $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = x \cdot e^{9x}$	**(06)**
	b)	Solve: $(D^2 - 7D + 10)y = 5x + 7$	**(05)**
	c)	State Dirichlet's condition for Fourier series.	**(03)**
Q-6		**Attempt all questions**	**(14)**
	a)	Find inverse Laplace transform by using convolution theorem	**(05)**

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

b) If $f(x) = \begin{cases} x, & 0 < x < \frac{\pi}{2} \\ \pi - x, & \frac{\pi}{2} < x < \pi \end{cases}$ **(05)**

Then show that $f(x) = \frac{\pi}{4} - \frac{2}{\pi}\left(\frac{\cos 2x}{1^2} + \frac{\cos 6x}{3^2} + \frac{\cos 10x}{5^2} + \cdots\right.$

c) Solve $\frac{d^2y}{dx^2} + 10\frac{dy}{dx} + 25y = 0$ **(04)**

Q-7 **Attempt all questions** **(14)**

a) Solve the given differential equation by using Laplace transform **(07)**
$y''' + 2y'' - y' - 2y = 0$, $y(0) = y'(0) = 0, y''(0) = 6$.

b) Express $f(x) = x + x^2$ as a Fourier series with period 2 in the range $-1 < x < 1$. **(07)**

Q-8 **Attempt all questions** **(14)**

a) Solve $\frac{d^2y}{dx^2} + 4y = tan2x$ by using method of variation parameters. **(07)**

b) Solve the equation $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$, given $u(x,0) = 6\,e^{-3x}$. **(07)**