Enrollment No: ______________________ Exam Seat No:______________________

C. U. SHAH UNIVERSITY
Winter Examination-2020

Subject Name : Engineering Mathematics - III

Subject Code : 4TE03EMT1/4TE03EMT2 Branch: B.Tech (All)

Semester: 3 Date: 08/03/2021 Time: 11:00 To 02:00 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 $f(D)y = X$ is given linear differential equation then its general solution is____. 01

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

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

b) If $f(-x) = -f(x)$ then f is 01

(a) Even function (b)Odd function

(c)(a) and (b) both (d) None of these

c) The operator $'D'$ means 01

(a)Degree of equation(b) Order of equation

(c)$\frac{d}{dx}$(d)None of these

d) If the function $f(x)$ is odd then which of the following is/are zero? 01

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

e) If roots of auxiliary equation are $m_1 = 1$ and $m_2 = -2$ then its C.F is___ 01

(a)$c_1e^x + c_2e^{-2x}$ (b)$c_1e^x + c_2e^{-x}$

(c) $c_1e^{-x} + c_2e^{-2x}$ (d) $c_1e^{2x} + c_2e^{-2x}$

f) If the differential equation is $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = 0$ then roots of auxiliary equation is/are_____ 01

(a)$m_1 = 1, m_2 = -2$ (b)$m_1 = -1, m_2 = -1$

(c)$m_1 = 1, m_2 = 1$ (d)$m_1 = 2, m_2 = -1$

g) The graph of odd function is symmetric about 01

(a) Opposite quadrant (b)X- axis

(c)Y-axis (d) None of these

h) Laplace transform of e^{2t+3} is 01

(a)$\frac{e^3}{s-2}(s > 2)$ (b)$\frac{e^2}{s-3}$

(c)$\frac{1}{s-\log 2}$ (d)$\frac{1}{s-2}$

i) Laplace transform of $t^{-\frac{1}{2}}$ is 01

(a)$\frac{\pi}{\sqrt{2}}$ (b) $\sqrt{(\frac{\pi}{s})}$ (c)$\frac{\sqrt{\pi}}{s}$ (d)None of these

j) $L(sin\ at) =$ ____ 01

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

k) $L^{-1}\left(\frac{12}{s^2-9}\right) =$ _____ 01

(a) $3\ sin\ h(4t)$(b) $4\ sin\ h(3t)$

(c) $4\ cos\ h\ (4t)$(d) $3\ cos\ h\ (4t)$

l) Which of the following is the partial differential equation of $z = ax + by + ab$by eliminating arbitrary constant . 01

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

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

m) The rate of convergence of Newton – Raphson method is 01

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

n) Solution of $(D^2 - 1)y = 0$ is 01

(a) $y = (c_1 + c_2)e^x$(b) $y = c_1e^{-x} + c_2e^x$

(c) $y = (c_1 + c_2x)e^x$ (d)None of these

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

Q-2		**Attempt all questions**	**[14]**
	a.	Find the root of equation $x^3 - 3x - 5 = 0$ using bisection method correct up to three decimal places.	**05**
	b.	Find real root of equation $xe^x - 3 = 0$,Which lies between 0.8 and 0.9 correct to three decimal places using False position method.	**05**
	c.	Find the root of equation by using Newton-Raphson method $2x - \tan x = 0, x > 0$.	**04**

Q-3		**Attempt all questions**	**[14]**
	a.	Expand $f(x) = x \sin x$ in a Fourier series in the interval $0 \le x \le 2\pi$.	**06**
	b.	Express $f(x) = x + x^2$ as a Fourier series with period 2 in the range $-1 < x < 1$.	**06**
	c.	State Dirichlet's condition for Fourier series.	**02**
Q-4		**Attempt all questions**	**[14]**
	a.	Find the Fourier cosine series corresponding to the function $f(x) = \pi - x$ defined in the interval 0 to π .	**05**
	b.	Prove that $\int_0^\infty \frac{e^{-at} - e^{-bt}}{t} dt = \log\frac{b}{a}$	**05**
	c.	Find Laplace transform of the function $f(t) = \begin{cases} \frac{t}{T}, 0 < t < T \\ 0, \quad t > T \end{cases}$.	**04**

Q-5 **Attempt all questions** **[14]**

a. Solve: $\frac{d^2y}{dx^2} + \frac{dy}{dx} + y = \cos 2x$ **05**

b. Find $L\left(\frac{\cos\ at - \cos\ bt}{t}\right)$ **05**

c. Find a root of the equation $x^3 - 9x + 1 = 0$, correct to three decimal places using False position method. **04**

Q-6 **Attempt all questions** **[14]**

a. Solve the given differential equation by using Laplace transform $y'' + 4y = 0$,$y(0) = 2, y'(0) = 8$. **07**

b. Solve: $(D^2 - 7D + 10)y = 5x + 7$ **05**

c. Write down general form of linear differential equation in higher order. **02**

Q-7 **Attempt all questions** **[14]**

a. Solve: $\frac{d^3y}{dx^3} - 7\left(\frac{dy}{dx}\right) - 6y = 0.$ **05**

b. Find inverse Laplace transform by using convolution theorem$L^{-1}\left\{\frac{s}{s^2+a^2}\right\}$ **05**

c. Find:$L(e^{4t} \sin 2t \cos t)$ **04**

Q-8 **Attempt all questions** **[14]**

a. Obtain the first three terms in the Fourier cosine series for y, where y is given in the following table: **07**

$\theta°$	0	60	120	180	240	300
y	4	8	15	7	6	2

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