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

C.U.SHAH UNIVERSITY

Summer Examination-2019

Subject Name : Engineering Mathematics – III
Subject Code : 4TE03EMT1 **Branch: B.Tech (All)**
Semester : 3 **Date : 11/03/2019** **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) One of the Dirichlet's condition is function $f(x)$ should be
(A) single valued (B) multi valued (C) real valued (D) None of these

b) If $f(x)=x$ is represented by Fourier series in $(-\pi,\ \pi)$ then a_0 equal to
(A) $\pi/2$ (B) π (C) 0 (D) 2π

c) In the Fourier series expansion of $f(x)=x^3$ in $(-1, 1)$
(A) only sine terms are present (B) both sine and cosine terms are present (C) only cosine terms are present (D) constant term is present

d) Laplace transform of C^{t+1} is
(A) $\dfrac{1}{S-C}$ (B) $\dfrac{C^1}{S-\log C}\left(S>\log C\right)$ (C) $\dfrac{C^2}{S+\log C}$
(D) None of these

e) $L^{-1}\left(\dfrac{12}{s^2-9}\right)$ = _____
(A) $3\sinh 4t$ (B) $4\sinh 3t$ (C) $4\cosh 3t$ (D) $3\cosh 4t$

f) Inverse Laplace transform of 1 is
(A) 1 (B) $\delta(t)$ (C) $\delta(t-1)$ (D) $u(t)$

g) The C. F. of the differential equation $\left(D^2-3D+2\right)y=e^{2x}$ is
(A) $c_1e^{x}+c_2e^{2x}$ (B) $c_1e^{-x}+c_2e^{-2x}$ (C) $c_1e^{-x}+c_2e^{2x}$ (D) $c_1e^{x}+c_2e^{-2x}$

h) The P.I. of $(D^2+a^2)y=\sin ax$ is
(A) $-\dfrac{x}{2a}\cos ax$ (B) $\dfrac{x}{2a}\cos ax$ (C) $-\dfrac{ax}{2}\cos ax$ (D) None of these

i) The P. I of $(D-a)y=X$, (where $X=k$ is constant) equal to
(A) $-\dfrac{k}{a}$ (B) $\dfrac{k}{a}$ (C) ka (D) $-$ka

j) The solution of $\dfrac{\partial^2 z}{\partial x^2}-\dfrac{\partial^2 z}{\partial y^2}=0$ is
(A) $z=f_1(y+x)+f_2(x-y)$ (B) $z=f_1(y+x)+f_2(y-x)$

(C) $z = f(x^2 - y^2)$ (D) None of these

k) Eliminating arbitrary function from $z = f\left(x^2 + y^2\right)$, the partial differential equation formed is

(A) $xq = yp$ (B) $xp = yq$ (C) $z = pq$ (D) None of these

l) The general solution of the equation $xp + yq = z$ is

(A) $F\left(\frac{x}{y}, \frac{y}{z}\right) = 0$ (B) $F\left(xy, x + y\right) = 0$ (C) $F\left(\frac{y}{x}, \frac{z}{y}\right) = 0$

(D) None of these

m) The order of convergence in Bisection method is

(A) linear (B) quadratic (C) zero (D) None of these

n) The criterion for convergence for solving $f\left(x\right) = 0$ by the Newton – Raphson method is

(A) $\left|\left\{f'(x)\right\}^2\right| > \left|f(x)\cdot f''(x)\right|$ (B) $\left|\left\{f'(x)\right\}^2\right| < \left|f(x)\cdot f''(x)\right|$

(C) $\left|\left\{f'(x)\right\}^2\right| = \left|f(x)\cdot f''(x)\right|$ (D) None of these

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

Q-2 **Attempt all questions** **(14)**

a) Given that one of the roots of the non-linear equation $x^3 - 2x - 5 = 0$ lies in the interval (1.75, 2.5). Find the root correct to four significant digits using False position method. **(5)**

b) Using Newton-Raphson method, find the root of $f(x) = \sin x + \cos x$ correct to three decimal places. **(5)**

c) Evaluate: $L\left(t\, e^{2t} \cos 3t\right)$ **(4)**

Q-3 **Attempt all questions** **(14)**

a) Show that $x^2 = \frac{\pi^2}{3} + 4\sum_{n=1}^{\infty}(-1)^n \frac{\cos nx}{n^2}$ in the interval $-\pi \le x \le \pi$. **(5)**

b) Obtain Fourier series for the function $f\left(x\right) = \begin{cases} \pi x, & 0 \le x \le 1 \\ \pi\left(2 - x\right), & 1 \le x \le 2 \end{cases}$ **(5)**

c) Given that one root of the equation $x^3 - 4x + 1 = 0$ lies between 1 and 2. Find the root correct to 3 significant digits using Secant method. **(4)**

Q-4 **Attempt all questions** **(14)**

a) Solve $y'' + y = t,\ y\left(\pi\right) = 0,\ y'\left(0\right) = 1$ **(5)**

b) Using convolution theorem, evaluate $\mathrm{L}^{-1}\left\{\frac{s}{\left(s^2 + 4\right)^2}\right\}$. **(5)**

c) Solve: $pz - qz = z^2 + \left(x + y\right)^2$ **(4)**

Q-5 **Attempt all questions** **(14)**

a) Evaluate: $L^{-1}\left(\frac{s}{s^4 + s^2 + 1}\right)$ **(5)**

	b)	Solve: $\frac{d^3y}{dx^3}+y=3+e^{-x}+5e^{2x}$	**(5)**
	c)	Solve: $\frac{\partial^2 z}{\partial x^2}-4\frac{\partial^2 z}{\partial y^2}=\cos 2x\ \cos 2y$	**(4)**
Q-6		**Attempt all questions**	**(14)**
	a)	Solve: $\left(D^2-1\right)y=\cosh x\cos x$	**(5)**
	b)	Obtain a half – range sine series to represent $f\left(x\right)=lx-x^2$ in the range $\left(0,\ l\right)$.	**(5)**
	c)	Solve: $L\left(\frac{e^{-at}-e^{-bt}}{t}\right)$	**(4)**
Q-7		**Attempt all questions**	**(14)**
	a)	Solve by the method of variation of parameters: $\frac{d^2y}{dx^2}+a^2y=\sec ax$	**(5)**
	b)	Solve: $(x+1)^2\frac{d^2y}{dx^2}+\left(x+1\right)\frac{dy}{dx}+y=2\cos\left[\log\left(1+x\right)\right]$	**(5)**
	c)	Solve: $\frac{\partial^2 z}{\partial x^2}-2\frac{\partial^2 z}{\partial x\partial y}+\frac{\partial^2 z}{\partial y^2}=e^{x+4y}$	**(4)**
Q-8		**Attempt all questions**	**(14)**
	a)	Using the method of separation of variables, solve $\frac{\partial u}{\partial x}=2\frac{\partial u}{\partial t}+u$, given $u\left(x,\ 0\right)=6e^{-3x}$	**(7)**
	b)	The following table gives the variations of periodic current $t=f(t)$ amperes over a period T sec.	**(7)**

t (sec) :	0	$\frac{T}{6}$	$\frac{T}{3}$	$\frac{T}{2}$	$\frac{2T}{3}$	$\frac{5T}{6}$	T
i (A) :	1.98	1.30	1.05	1.30	– 0.88	– 0.5	1.98

Show, by harmonic analysis, that there is a direct current part of 0.75 amp. in the variable current and obtain the amplitude of the first harmonic.