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

C.U.SHAH UNIVERSITY

Summer Examination-2016

Subject Name : Engineering Mathematics - III

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

Semester : 3 **Date :** 19/04/2016 **Time :** 02:30 To 5:30 **Marks :** 70

Instructions:

1. (1) Use of Programmable calculator & any other electronic instrument is prohibited.
2. (2) Instructions written on main answer book are strictly to be obeyed.
3. (3) Draw neat diagrams and figures (if necessary) at right places.
4. (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) Fourier expansion of an odd function f(x) in $(-\pi, \pi)$ has
(a) only sine terms (b) only cosine terms (c) both sine and cosine terms
(d) None of these

c) If $f(x) = x$ is represented by Fourier series in $(-\pi, \pi)$, a_0 equals to
(a) $\pi/2$ (b) π (c) 0 (d) 2π

d) Laplace transform of e^{2t+3} is
(a) $\frac{e^3}{s-2}$ $(s>2)$ (b) $\frac{e^2}{s-3}$ (c) $\frac{1}{s-\log 2}$ (d) $\frac{1}{s-2}$

e) Laplace transform of $t^{\frac{-1}{2}}$ is
(a) $\frac{\pi}{\sqrt{s}}$ (b) $\sqrt{\frac{\pi}{s}}$ (c) $\frac{\sqrt{\pi}}{s}$ (d) None of these

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 $(D^3 + 2D^2 + D) = x^2$ is
(a) $y = c_1 + (c_2x + c_3)e^{2x}$ (b) $y = c_1 + (c_2 + c_3x)e^{-x}$ (c) $y = c_1 + (c_2x + c_3)e^{x}$
(d) None of these

h) The P.I. of $(D^2 + a^2)y = \sin ax$ is
(a) $-\frac{x}{2a}\cos ax$ (b) $\frac{x}{2a}\cos ax$ (c) $-\frac{ax}{2}\cos ax$ (d) None of these

i) The P. I of $(D-a)y = X$, (where $X = k$ is constant) equals to

(a) $-\frac{k}{a}$ (b) $\frac{k}{a}$ (c) ka (d) $-$ka

j) Eliminating arbitrary constants a and b from $z=(x+a)(x+b)$, the partial differential equation formed is

(a) $z=\frac{p}{q}$ (b) $z=p+q$ (c) $z=pq$ (d) None of these

k) The solution of $\frac{\partial^2 z}{\partial x^2}-\frac{\partial^2 z}{\partial y^2}=0$ 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

l) Particular integral of $\left(D^2-D'^2\right)z=\cos(x+y)$ is

(a) $\frac{x}{2}\cos(x+y)$ (b) $x\sin(x+y)$ (c) $x\cos(x+y)$ (d) $\frac{x}{2}\sin(x+y)$

m) The order of convergence in Bisection method is
(a) linear (b) quadratic (c) zero (d) None of these

n) The order of convergence in Newton-Raphson method is
(a) 1 (b) 3 (c) 0 (d) 2

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

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

a) Obtain a cosine series for the function $f(x)=e^x$ in the range $(0, l)$. **(5)**

b) Evaluate: $L^{-1}\left[\frac{2s^2-4}{(s+1)(s-2)(s-3)}\right]$ **(5)**

c) Show that the frequency of free vibrations in a closed electrical circuit with inductance L and capacity C in series is $\frac{30}{\pi\sqrt{LC}}$ cycles/minute. **(4)**

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

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

b) Solve: $\left(D^4-1\right)y=e^x\cos x$ **(5)**

c) Solve: $\frac{\partial^2 z}{\partial x\partial y}=x^3+y^3$ **(4)**

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

a) Solve: $\left(D^2-2D+1\right)y=xe^x\sin x$ **(5)**

b) Solve: $x^2\left(y-z\right)p+y^2\left(z-x\right)q=z^2\left(x-y\right)$ **(5)**

c) Solve: $\frac{\partial^2 z}{\partial x^2}+3\frac{\partial^2 z}{\partial x\partial y}+2\frac{\partial^2 z}{\partial y^2}=x+y$ **(4)**

(14)

Q-5 **Attempt all questions**

a) Solve by the method of variation of parameters: (5)

$$\frac{d^2y}{dx^2}+a^2y=\sec ax$$

b) Find the positive root of $x^3+2x^2+10x-20=0$ by Newton-Raphson method. (5)

c) Solve: $L\left(\frac{e^{-at}-e^{-bt}}{t}\right)$ (4)

Q-6 **Attempt all questions** (14)

a) Expand $f(x)$ in Fourier series in the interval $(0,2\pi)$ if (7)

$$f(x)=\begin{cases}-\pi, & 0<x<\pi \\ x-\pi, & \pi<x<2\pi\end{cases}$$ and show that $\sum_{r=0}^{\infty}\frac{1}{(2r+1)^2}=\frac{\pi^2}{8}$.

b) Using the method of separation of variables, (7)

solve $\frac{\partial u}{\partial x}=2\frac{\partial u}{\partial t}+u$, given $u(x,\ 0)=6e^{-3x}$

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

a) 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.

b) Using Regula Falsi method, compute the real root of $x\log_{10}x-1.2=0$ correct to five decimal places. (7)

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

a) Using Laplace transform method, solve (7)

$y''+3y'+2y=e^t,\ y(0)=1,\ y'(0)=0$

b) Solve: $(D^2-1)y=\cosh x\cos x$ (7)