Enrollment No: ______________________ Exam Seat No:______________________

C.U.SHAH UNIVERSITY

Summer Examination-2017

Subject Name: Engineering Mathematics-III

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

Semester: 3 **Date: 21/03/2017** **Time: 10:30 To 01:30** **Marks: 70**

Instructions:

(1) Use of Programmable calculator and 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) State Dirichlet's conditions for Fourier series. **(02)**

b) State and prove first shifting theorem. **(02)**

c) Find: $L\left(5-\sin^2 2t-\cos^2 2t\right)$ **(02)**

d) Solve: $\left(D^3+D\right)y=0$ **(02)**

e) Find: $L\left(t^3e^{3t}\right)$ **(02)**

f) Eliminate the arbitrary function from the equation $z=xy+f\left(x+y\right)$ **(02)**

g) Derive the iterative formula for finding the reciprocal of positive number N by Newton-Raphson method. **(02)**

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

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

a) Obtain the constant term and the co-efficient of the second sine and cosine terms in the Fourier expansion of y as given in the following table: **(07)**

x	0	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	π	$\frac{4\pi}{3}$	$\frac{5\pi}{3}$	2π
y	1	1.4	1.9	1.7	1.5	1.2	1

b) Solve the differential equation $\left(y''+3y'+2y\right)=e^t;\ y\left(0\right)=1, y'\left(0\right)=0$ by using Laplace Transformation. **(07)**

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

a) Obtain Fourier series of $f(x)=x^2$ in $(-\pi,\pi)$ and hence deduce that $\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+\ldots=\frac{\pi^2}{12}$. **(05)**

b) Find the Fourier series of $f(x)=\begin{cases} x & -1<x<0 \\ x+2 & 0<x<1 \end{cases}$. **(05)**

c) Find the half range sine series of $f(x)=\begin{cases} x & 0<x<\frac{\pi}{2} \\ \pi-x & \frac{\pi}{2}<x<\pi \end{cases}$. **(04)**

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

a) Find Laplace Transformation of $\sin 2t$ and t^n by using the definition of it. **(05)**

b) Evaluate: $L\left(te^{-2t}\sin^2 t\right)$ **(05)**

c) State Convolution Theorem and using it find $L^{-1}\left(\frac{1}{(s-2)(s+2)^2}\right)$. **(04)**

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

a) Solve the differential equation $\left(D^2+2D+1\right)y=e^{-x}\log x$ by the method of variation of parameter. **(05)**

b) Solve: $\left(D^4-1\right)y=e^x\cos x$ **(05)**

c) Solve: $\left(D^2-4D+4\right)y=e^{2x}+\cos 2x+x^3$ **(04)**

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

a) Obtain a formula for qth root of a positive integer N and find the value of $\sqrt{28}$ by Newton-Raphson method up to four significant digits. **(05)**

b) Find the root of the equation $x^3-2x+5=0$ by bisection method up to three decimal places. **(05)**

c) Find the roots of equation $\cos x-xe^x=0$ by using secant method correct up to four decimal places. **(04)**

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

a) Solve the differential equation $\frac{\partial u}{\partial x}=2\frac{\partial u}{\partial t}+u;\ u(x,0)=6e^{-3x}$ by the method of separation of variables. **(05)**

b) Solve: $\frac{\partial^2 z}{\partial x\partial y}=\sin x\cos y$, given that $\frac{\partial z}{\partial y}=-2\cos y$ when $x=0$ and $z=0$ when y is a multiple of π. **(05)**

c) Find the general solution of the differential equation $(y+z)p+(z+x)q=(x+y)$. **(04)**

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

a) Solve: $\left(x^2D^2 + xD\right)y = \dfrac{12\log x}{x^2}$ **(05)**

b) Find: $L^{-1}\left(\dfrac{4s+5}{(s-1)^2(s+2)}\right)$ **(05)**

c) Form the partial differential equation $f\left(x^2+y^2+z^2, xyz\right)=0$. **(04)**