Enrollment No: ______________________ Exam Seat No: ______________________

C.U.SHAH UNIVERSITY

Summer Examination-2019

Subject Name : Engineering Mathematics - 3

Subject Code : 4TE03EMT2 **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) The period of $\sin pt$ is

(A) 2π (B) $\frac{2\pi}{p}$ (C) $\frac{\pi}{p}$ (D) None of these

b) If the Fourier series expansion of $f(x)=|x|$ in $(-\pi,\pi)$, the value of b_n equal to

(A) 0 (B) π (C) 2π (D) $\frac{\pi}{2}$

c) 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

d) Inverse Laplace transform of $\frac{1}{(s+4)^6}$ is

(A) $e^{-6t}\frac{t^4}{4!}$ (B) $e^{-4t}\frac{t^6}{6!}$ (C) $e^{-4t}\frac{t^5}{5!}$ (D) $e^{-4t}\frac{t^6}{5!}$

e) 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) $\frac{1}{s-2}$

f) Laplace transform of $\frac{\sin t}{t}$ is

(A) $\cot^{-1}\frac{1}{s}$ (B) $\tan^{-1}s$ (C) $\tan^{-1}\frac{1}{s}$ (D) $\sin^{-1}s$

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 $(D+1)^2\,y=e^{-x}$ is

(A) $\frac{x^2}{2}e^{-x}$ (B) x^2e^{-x} (C) xe^{-x} (D) $\frac{x^2}{2}e^{x}$

i) The P. I of $\left(D^2+1\right)y=\cosh 3x$ is

(A) $\frac{1}{10}\cosh 3x$ (B) $\frac{1}{10}\sinh 3x$ (C) $\frac{1}{5}\cosh 3x$ (D) None of these

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 general solution of the equation $z=px+qy+p^2q^2$ is

(A) $z=ax+by+c$ (B) $z=ax+by+a^2+b^2$ (C) $z=ax+by-a^2b^2$

(D) $z=ax+by+a^2b^2$

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 Newton-Raphson method is

(A) 1 (B) 3 (C) 0 (D) 2

n) The Bisection method for finding the root of an equation $f\left(x\right)$ is

(A) $x_{n+1}=\frac{1}{2}\left(x_n+x_{n-1}\right)$ (B) $x_{n+1}=\frac{1}{2}\left(x_n-x_{n-1}\right)$ (C) $x_{n+1}=\left(x_n+x_{n-1}\right)$

(D) None of these

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

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

a) One real root of the equation $e^{-x}-x=0$ lies between 0 and 1. Find the root using Bisection 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) Expand $f(x)$ in Fourier series in the interval $(0,2\pi)$ if **(5)**

$$f(x)=\begin{cases}-\pi, & 0<x<\pi\\ x-\pi, & \pi<x<2\pi\end{cases}.$$

b) Find a Fourier series with period 3 to represent $f\left(x\right)=2x-x^2$ in the range (0, 3). **(5)**

c) Find the root of the equation $\cos x-3x+1=0$ correct to three decimal positions using False position 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 $L^{-1}\left\{\dfrac{s^2}{\left(s^2+a^2\right)\left(s^2+b^2\right)}\right\}$. **(5)**

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

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

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

b) Solve: $\dfrac{d^3y}{dx^3}+\dfrac{d^2y}{dx^2}-\dfrac{dy}{dx}-y=\cos 2x$ **(5)**

c) Solve: $\left(y^2+z^2\right)p-xyq-xz=0$ **(4)**

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

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

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

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

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

a) Using the method of variation of parameters, **(5)**

Solve: $y''-6y'+9y=\dfrac{e^{3x}}{x^2}$

b) Solve: $x^3\dfrac{d^3y}{dx^3}+2x^2\dfrac{d^2y}{dx^2}+2y=10\left(x+\dfrac{1}{x}\right)$ **(5)**

c) Solve: $\dfrac{\partial^2 z}{\partial x^2}-2\dfrac{\partial^2 z}{\partial x\partial y}+\dfrac{\partial^2 z}{\partial y^2}=e^{x+4y}$ **(4)**

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

a) Solve by the method of separation of variables **(7)**

$4\dfrac{\partial u}{\partial x}+\dfrac{\partial u}{\partial y}=3u$, given that $u=3e^{-y}-e^{-5y}$ when $x=0$.

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.