Enrollment No: _____ **Exam Seat No:**_____

C.U.SHAH UNIVERSITY
Winter Examination-2018

Subject Name : Engineering Mathematics - III

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

Semester : 3 **Date : 27/11/2018** **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 $f(x) = x$ is represented by Fourier series in $(-\pi, \pi)$ then a_0 equal to

(A) $\pi/2$ (B) π (C) 0 (D) 2π

c) Fourier expansion of an even 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) 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

e) 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) $\sin^{-1} s$

f) 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) $e^{-4t}\frac{t^6}{5!}$

g) $\frac{1}{D-a}X$, (Where $X = k$ is constant) equal to

(A) $-\frac{k}{a}$ (B) $\frac{k}{a}$ (C) ka (D) $-ka$

h) The C. F. of the differential equation $(D^3 + 2D^2 + D)y = x^2$ is

(A) $c_1+(c_2x+c_3)e^{2x}$ (B) $c_1+(c_2+c_3x)e^{-x}$ (C) $c_1+(c_2x+c_3)e^{x}$
(D) None of these

i) 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) $\frac{x^2}{2}e^{x}$

j) Eliminating arbitrary function from a and b from $z=(x+a)(y+b)$, 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) The solution of $\frac{\partial^3 z}{\partial x^3}=0$ is

(A) $z=f_1(y)+xf_2(y)+x^3f_3(y)$ (B) $z=(1+x+x^2)f(y)$
(C) $z=f_1(x)+yf_2(x)+y^3f_3(x)$ (D) $z=(1+y+y^2)f(x)$

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) Evaluate $\sqrt{12}$ correct to three decimal places using Newton-Raphson method. **(5)**

b) One real root of the equation $e^{-x}-x=0$ lies between 0 and 1. Find the root using Bisection method. **(5)**

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

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

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

b) **(5)**

If $f(x)=x, \quad 0<x<\frac{\pi}{2}$

$=\pi-x, \quad \frac{\pi}{2}<x<\pi$

then show that $f(x)=\frac{\pi}{4}-\frac{2}{\pi}\left(\frac{\cos 2x}{1^2}+\frac{\cos 6x}{3^2}+\frac{\cos 10x}{5^2}+.....\right)$.

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

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

a) Using Laplace transform method solve: **(5)**

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

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

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

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

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

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

c) Solve: $\dfrac{\partial^2 z}{\partial x\partial y}=x^3+y^3$ **(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) Evaluate: $L\left(\dfrac{\cos 2t-\cos 3t}{t}\right)$ **(4)**

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

a) Using the method of variation of parameters, Solve: $y''-6y'+9y=\dfrac{e^{3x}}{x^2}$ **(5)**

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

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

a) Determine the Fourier series up to and including the second harmonic to represent the periodic function $y=f(x)$ defined by the table of values given below. $f(x)=f(x+2\pi)$ **(7)**

x°	0	30	60	90	120	150	180	210	240	270	300	330
$f(x)$	0.5	0.8	1.4	2.0	1.9	1.4	1.2	1.4	1.1	0.5	0.3	0.4

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

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