C.U.SHAH UNIVERSITY
Summer Examination-2019

Subject Name : Mathematical methods -I
Subject Code : 5SC03MAM1   **Branch: M.Sc. (Mathematics)**
Semester : 3   **Date : 13/03/2019**   **Time : 02:30 To 05:30   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.

SECTION – I

Q-1   **Attempt the Following questions**   **(07)**
    a. Define : Odd function.   **(01)**
    b. What is period of $f(x) = \sin 2x + \cos x$?   **(02)**
    c. Give one example of function which is neither even nor odd.   **(02)**
    d. Write any one application of Z-transform.   **(02)**

Q-2   **Attempt all questions**   **(14)**
    a. Define : Fourier series of odd function on (-l ,l)   **(02)**
    b. Find Fourier series of e^{ax} in the interval (0 , 2π).   **(06)**
    c. What is half range Fourier cosine series ? Find half range Fourier cosine series of $f(x)= x$ in (0 ,2).   **(06)**

OR

Q-2   **Attempt all questions**   **(14)**
    a. State Dirichlet's conditions for the existence of Fourier series   **(02)**
    b. Find Fourier series of $f(x) = x + x^2$; where $-2 \leq x \leq 2$.   **(06)**
    c. Find half range fourier sine series of $f(x)= e^x \cos x$ in (-2,0).   **(06)**

Q-3   **Attempt all questions**   **(14)**
    a. Prove that $F\{f(x)\cos ax\}=\frac{1}{2}\{F(s + a) + F(s - a) \}$ **(02)**
    b. Find fourier transform of $e^{\frac{x^2}{2}}$.   **(06)**
    c. Find the Fourier sine transform of $f(x)=\begin{cases} 0 \ ; \ 0 < x < a \\ x \ ; \ a < x < b \\ 0 \ ; \ b < x \end{cases}$ **(06)**

OR

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

a.	Define : Fourier transform .	**(02)**
b.	Find Fourier transform of $e^{-a|x|}$.	**(06)**
b.	Find the Fourier integral representation of $f(x)=\begin{cases} sinx \; ; 0 \leq x \leq \pi \\ 0 \quad ; \quad x > \pi \end{cases}$	**(06)**

SECTION – II

Q-4   **Attempt the Following questions**   **(07)**

a.	What is Z-transform?	**(01)**
b.	Write any one application of Laplace transform.	**(02)**
c.	Define: Laplace inverse transform.	**(02)**
d.	Find $L(2^t)$.	**(02)**

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

a.	Show that $L(sinat)=\frac{a}{s^2+a^2}$.	**(02)**
b.	State and prove laplace transform of periodic function.	**(06)**
c.	Evaluate (1) L(tcost + sint) (2) $L(t^2 sin2t)$	**(06)**

OR

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

a.	Find $L(cos2t + 2t^2)$.	**(02)**
b.	State and prove Laplace transform of nth derivative of function .	**(06)**
c.	Find Laplace transform of $f(t)=\begin{cases} 1 \; ; \; 0 \leq t < 1 \\ t \; ; \; 1 \leq t < 2 \\ 2 \; ; \; 2 \leq t \end{cases}$	**(06)**

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

a.	State first shifting theorem of Laplace transform.	**(02)**
b.	State and prove convolution theorem.	**(06)**
c.	Find inverse Laplace transform of	**(06)**

     (1) $\frac{s+1}{(s^2-1)(s+2)}$ (2) $\frac{s}{(s^2+4a^2)(s-1)}$.

OR

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

a.	Define : Error function.	**(02)**
b.	Prove that $Z(cosn\theta)=\frac{z(z-cos\;\theta)}{z^2-2zcos\theta+1}$ and $Z(sinn\theta)=\frac{zsinn\theta}{z^2-2zcos\theta+1}$; where $|z| > 1$.	**(06)**
c.	Using laplace transform solve : y''+3y'+2y $= te^{-t}$; where y(0)=1 and y'(0)=0.	**(06)**