YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY, FARIDABAD
M.Sc. Math EXAMINATION (Under CBS) , May -2018
Transform Techniques (MT 506)

Time: 3hrs **M.Marks:75**

Note: All the questions in Part-I are compulsory and attempt any four questions form PART-II.

PART -I

Q.1.

I. Find the Laplace transform of $sin2t\, sin3t$.
II. State and prove change scale property of Fourier transform .
III. State convolution theorem for inverse Laplace transform .
IV. Write the formula for Fourier sine and cosine transform .
V. Find Fourier transform of f(x)=$e^{\frac{-x^2}{2}}$ $-\infty < x < \infty$
VI. Write any two application of Fourier transform.
VII. Find the inverse Laplace transform of $cot^{-1}\frac{s}{2}$
VIII. Find the Z-transform of n.
IX. Find the inverse Z- transform of $\frac{10z}{z^2-3z+2}$
X. Define any two methods for finding inverse Z transform .

(1.5×10=15)

PART-II

Q.2(a) Find the Laplace transform of (7)

$$f(t) = \begin{cases} cos\left(t-\frac{2\pi}{3}\right), t > \frac{2\pi}{3} \\ 0, \quad t < \frac{2\pi}{3} \end{cases}$$

(b) Find the inverse laplace transform of $\frac{s}{s^4+4a^4}$ (8)

Q.3 (a) Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, $x > 0, t > 0$ subject to the conditions

i) u=0,when x=0, t > 0
ii) $u = \begin{cases} 1, 0 < x < 1 \\ 0, x \geq 1 \end{cases}$, when t = 0
iii) $u(x,t)$ *is bounded*

(15)

Q.4 (a) Find the Fourier sine transform of $x^{n-1}, n > 0$ (7)

(b) find the Fourier cosine transform of f(x) $= \frac{1}{1+x^2}$ .Hence derive Fourier sine transform of $\phi(x) = \frac{1}{x(1+x^2)}$ (8)

Q.5 (a) Solve the following equations by the transform method :

$\frac{d^3y}{dt^3} + 2\frac{d^2y}{dt^2} - \frac{dy}{dt} - 2y = 0, where\ y = 1, \frac{dy}{dt} = 2, \frac{d^2y}{dt^2} = 2\ at\ t = 0$. (7)

(b) Solve the following simultaneous equations (by using Laplace transforms) (8)

$\frac{dx}{dt} - y = e^t, \frac{dy}{dt} + x = sint, given\ x(0) = 1, y(0) = 0.$

Q.6 (a) Find Z –transform of sin (3K+5) (7)

(b)Find the inverse Z-transform of $\frac{1}{(z-3)(z-2)}$ (8)

(i) $|z| < 2$ (ii) $2 < |z| < 3$ (iii) $|z| > 3$

Q.7 (a) Solve $x'' + 4y = 4t, 4x + y'' = 0$

given that $x(0) = x'(0) = 0$; $y(0) = y'(0) = 0$ (7)

(b) Find the general solution of the differential equation using Laplace transform (8)

$(D^3 - 3D^2 + 3D - 1)y = x^2e^x$