



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc.DEGREE EXAMINATION –MATHEMATICS

THIRD SEMESTER – APRIL 2019

MT 3504– INTEGRAL TRANSFORMS & PARTIAL DIFF. EQUATIONS

Date: 24-04-2019
Time: 01:00-04:00

Dept. No.

Max. : 100 Marks

PART – A

ANSWER ALL THE QUESTIONS

(10 x 2 = 20)

1. Eliminate a and b from $z = (x + a)(y + b)$.
2. Solve $\frac{\partial^2 z}{\partial y^2} = \sin y$.
3. Find $L(t^2 + 2t + 3)$.
4. Find $L(t \sin at)$.
5. Write the inverse Laplace transform formula for $\frac{1}{s-a}$.
6. Find $L^{-1}\left(\frac{1}{(s+1)^2 + 1^2}\right)$
7. Prove that $F\{f(x-a)\} = e^{-as}F(s)$.
8. Prove that $F\{e^{ax}f(x)\} = F(s+a)$.
9. Show that $F_c\{f(ax)\} = \frac{1}{a}F_c\left\{\frac{s}{a}\right\}$.
10. Prove that $F_s\{F_s(x)\} = f(s)$.

PART – B

ANSWER ANY FIVE QUESTIONS

(5 x 8 = 40)

11. Solve $q = xp + p^2$.
12. Solve $z^4 q^2 - z^2 p = 1$.
13. Find $L\left(\frac{1-e^t}{t}\right)$
14. Evaluate $\int_0^\infty e^{-2t} \sin 3t dt$.
15. Find $L^{-1}\left[\frac{1}{s(s+1)(s+2)}\right]$.
16. Find $L^{-1}\left[\frac{s+2}{(s^2+4s+5)^2}\right]$.
17. Show that $F\{x^n f(x)\} = (-i)^n \frac{d^n}{ds^n} F\{f(x)\}$.
18. Show that $F_c\left\{\frac{1}{\sqrt{x}}\right\} = F_s\left\{\frac{1}{\sqrt{x}}\right\} = \frac{1}{\sqrt{s}}$.

PART – C

ANSWER ANY TWO QUESTIONS

(2x 20 = 40)

19. (a) Solve $p^2 + q^2 - 2px - 2qy + 1 = 0$.

(b) Solve $(y + z)p + (z + x)q = x + y$. **(10+10)**

20. Using Laplace transform, solve the equation $\frac{d^2 y}{dt^2} + 2\frac{dy}{dt} - 3y = \sin t$ given that $y = \frac{dy}{dt} = 0$ when $t = 0$. **(20)**

21.(a) Find the Fourier transform of e^{-x} .

(b) State and prove convolution theorem. **(6+14)**

22. (a) Find the Fourier Cosine transform for F(x) if $f(x) = \begin{cases} 1, & \text{when } |x| < 1 \\ 0, & \text{when } |x| > 1 \end{cases}$.

(b) Solve the integral equation $\frac{1}{2} \int_0^{\infty} f(t) e^{-|x-t|} dt = h(x)$, where h(x) is a given function. **(10+10)**
