LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **MATHEMATICS**

THIRD SEMESTER – **NOVEMBER 2018**

16/17UMT3MC01– INTEGRAL TRANSFORMS AND PARTIAL DIFF. EQUATIONS

Date: 29-10-2018 Dept. No. Max. : 100 Marks

Time: 01:00-04:00

PART – A

ANSWER ALL THE QUESTIONS: (10x2=20 Marks)

1) Find $L\,[\cos h\; at]$.

2) Find $L\,[t^2 + 2t + 3]$.

3) Find $L^{-1}\left[\frac{1}{(s-3)^2+4}\right]$.

4) Find $L^{-1}\left[\frac{1}{(s-3)^2}\right]$.

5) Show that $F\left[e^{iax}\, f(x)\right] = F\,(s+a)$ where F(s) = F [f(x)].

6) State the linearity property of Fourier transforms.

7) Prove that $F_c\{f(x)cosax\} = \frac{1}{2}[F_c(s+a) + F_c(s-a)]$.

8) Prove that $F_s\{f\;(ax)\} = \frac{1}{a}F_s\left(\frac{s}{a}\right)$.

9) Eliminate the arbitrary function form $z = f(x^2 + y^2)$.

10) Solve $\frac{\partial^2 z}{\partial y^2} = \sin y$.

PART – B

ANSWER ANY FIVE QUESTIONS: (5x8=40 Marks)

11) Evaluate $L\left[\frac{1-e^t}{t}\right]$.

12) Evaluate $L\,[t\,e^{-t}\sin t]$.

13) Evaluate $L^{-1}\left[\frac{1}{s(s+1)(s+2)}\right]$.

14) Evaluate $L^{-1}\left[\frac{s}{(s-1)^3}\right]$.

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

Also deduce that $\int_0^\infty \frac{Sin\ t}{t}\, dt = \frac{\pi}{2}$.

16) Prove that $F\{x^n f(x)\} = (-i)^n \frac{d^n}{ds^n} F\{f(x)\}$.

17) Find the general solution of (y + z)p + (z + x) q = x + y.

18) Solve $p^2 + q^2 = npq$

PART –C

ANSWER ANY TWO QUESTIONS: **(2X20= 40 Marks)**

19) a) Evaluate $\int_0^\infty te^{-3t}\ cost\ \ dt$.

b) Evaluate $L^{-1}\left[\frac{1\,+\,2s}{(s+2)^2(s-1)^2}\right]$.

20) Solve the equation $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} - 3y = sint$ given that $y = \frac{dy}{dt} = 0$ when t = 0.

21) a) State and prove Convolution theorem.

b) State and prove Parseval's identity for Fourier transform.

22) a) Solve p $(1+ q^2)$ = q (z-1)

b) Find the partial differential equation by eliminating the arbitrary function in

$f(x+y+z, x^2 + y^2 - z^2) = 0$.

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