LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRD SEMESTER – **NOVEMBER 2016**

MT 3504 – INTEGRAL TRANSFORMS & PARTIAL DIFF. EQUATIONS

Date: 08-11-2016 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

Part – A

Answer ALL the questions: **(10x2=20 marks)**

1) Form a partial differential equation by eliminating the arbitrary constants a and b from z = (x+a) (y+b)

2) Solve $\frac{\partial^2 z}{\partial x^2} = \cos y$

3) Find L $[t^2 e^{-3t}]$

4) Evaluate $\int_0^\infty e^{-2t} \sin 3t \, dt$

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

6) Find $L^{-1}\left[\frac{1}{(S+2)^2+16}\right]$

7) Define the complex form of Fourier integral.

8) If F[f(x)]=F(s). Then prove that $F[f(ax)] = \frac{1}{a}F(\frac{S}{a})$

9) State Parsival's identify for Fourier series.

10) Find $F_c\{e^{-ax}\}$

Part – B

Answer any FIVE questions: **(5x8=40 marks)**

11) Solve : p $(1+q^2)$ = q (z-1)

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

13) Evaluate $\int_0^\infty \frac{e^{-t}-e^{-2t}}{t} dt$

14) Evaluate L[$t\, e^{-t} \cos t$]

15) Evaluate L^{-1} [$\frac{1}{S(S+1)(S+2)}$]

16) Evaluate L^{-1} [$\frac{S-3}{S^2+4S+13}$]

17) If F [f(x)] = F (S), Prove that

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

18) Show that $F_c\left(\frac{1}{\sqrt{x}}\right) = \frac{1}{\sqrt{S}}$

Part – C

Answer any TWO questions: **(2x20=40 marks)**

19) a) Solve the partial differential equation by Charpit's method $p^2 - xp - q=0$. (12)

b) Solve $p^2 + q^2 = npq$. (8)

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) Evaluate : $\int_0^{\infty} t\, e^{-3t}\, Sin\, t\, dt$ (10)

b) Find the Fourier transform of e^{-x} (10)

22) a) Prove that

$$F_C\left\{f'(x)\right\} = \sqrt{\frac{2}{\pi}}f(0) + sF_s(s) \text{ if } f(x) \to 0 \text{ as } x \to \infty.$$

b) State and prove convolution theorem. (10+10)

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