LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION - **MATHEMATICS**

THIRD SEMESTER – NOVEMBER 2015

MT 3504 - INTEGRAL TRANSFORMS & PARTIAL DIFF. EQUATIONS

Date : 06/11/2015 Dept. No. Max. : 100 Marks
Time : 09:00-12:00

PART – A

Answer ALL the questions: **(10 x 2 = 20 marks)**

1. Form the partial differential equations by eliminating a and b from $z = ax + by + a^2 + b$.
2. Find the complete solution of p+q= pq.
3. Find $L\left(\frac{e^{at}-1}{a}\right)$.
4. Find $L(t^3 e^{-3t})$.
5. Find $L^{-1}\left(\frac{s-2}{(s-2)^2+5^2}\right)$.
6. Find $L^{-1}\left(\frac{3s+1}{(s+1)^4}\right)$.
7. It $f_c(s)$ is the Fourier Cosine transform of $F(x)$, then show that Fourier Cosine transform of $F\left(\frac{x}{a}\right)$ is $af_c(as)$.
8. State convolution theorem on Fourier transforms.
9. Find Fourier sine transform of $f(x) = \frac{1}{x}$.
10. State parseval's identity for Fourier series.

PART – B

Answer any FIVE questions: **(5 x 8 = 40 marks)**

11. Solve: $z^2 = xypq$.
12. Solve: $q = -px + p^2$.
13. Find $L\{F(t)\}, it$

$$F(t) = \begin{cases} (t-1)^2, & t > 1 \\ 0, & 0 < t < 1 \end{cases}.$$

14. Show that $\int_0^\infty te^{-3t} \sin t \, dt = \frac{3}{50}$.
15. If $L^{-1}\left\{\frac{s^2-1}{(s^2+1)^2}\right\} = t\cos t$, then find $L^{-1}\left\{\frac{9s^2-1}{(9s^2+1)^2}\right\}$.
16. Find $L^{-1}\left\{\frac{3p+7}{p^2-2p-3}\right\}$.

17. If f (s) is the Fourier transform of F(x), then prove that $\frac{1}{a} f\left(\frac{s}{a}\right)$ is the Fourier transform of F(ax).

18. Show that the Fourier transform of $f(x) = e^{\frac{-x^2}{2}}$ is $\sqrt{2®}\ e^{\frac{-p^2}{2}}$.

PART – C

Answer any TWO questions: **(2 x 20 = 40 marks)**

19. (a) Solve $z^2\left(p^2x^2 + q^2\right) = 1.$

(b) Solve (1+y) p + (1+x)q = z. (10 +10)

20. Using Laplace transform solve the equation $\left(D^2 - 3D + 2\right)y = 1 - e^{2t}, y = 1, D_y = 0,$ when t = 0.

21. a) Find $L^{-1}\left\{\frac{1}{s}\log\frac{s+2}{s+1}\right\}.$

b) Solve: $\int_0^\infty f(x)\cos ª\, xdx = e^{-ª}$. (10 +10)

22. Find the sine transform of $\frac{x}{1+x^2}.$

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