



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – MATHEMATICS

THIRD SEMESTER – APRIL 2017

MT 3504- INTEGRAL TRANSFORMS & PARTIAL DIFF. EQUATIONS

Date: 03-05-2017
09:00-12:00

Dept. No.

Max. : 100 Marks

SECTION – A

Answer ALL questions (10 × 2 = 20)

1. Form a partial differential equation by eliminating a and b from $z = ax + by + a^2 + b^2$.
2. Form a partial differential equation by eliminating the arbitrary function from $z = f(x^2 - y^2)$.
3. Find $L(t^2 e^{-3t})$.
4. State the initial value theorem for Laplace transform.
5. Compute $L^{-1}\left(\frac{s}{(s+2)^2}\right)$.
6. Find $L^{-1}\left(\frac{1}{s(s+a)}\right)$.
7. Define complex form of Fourier integral.
8. Show that $F(F(x)) = f(-s)$.
9. Define Fourier cosine transform.
10. State Parseval's identity.

SECTION – B

Answer any FIVE questions.

(5 × 8 = 40)

11. Solve $\sqrt{p} + \sqrt{q} = 1$.
12. Solve $(y + z)p + (z + x)q = x + y$.
13. Find $L(t \sin^2 t)$.
14. Find $L\left(\frac{\cos 3t - \cos 2t}{t}\right)$.
15. Find $L^{-1}\left(\frac{s-1}{2s^2+s+6}\right)$.
16. Find $L^{-1}\left(\frac{s}{(s^2 + 4)^2}\right)$.
17. Show that $F\{f(ax)\} = \frac{1}{|a|} F\left(\frac{s}{a}\right)$ for $a \neq 0$.
18. Find $F_c\left(\frac{1}{1+x^2}\right)$ and $F_s\left(\frac{1}{1+x^2}\right)$.

SECTION – C

Answer any TWO questions(2 × 20 = 40)

19. (a) Solve $1 + q^2 = q(z-b)$.

(b) Solve $p+q = pq$.

(c) $z = xp + yq + p^2 - q^2$ (6+6+8)

20. (a) Find $L(t^2 \cos 4t)$

(b) Find $L\left(\frac{e^{3t}-e^{-2t}}{t}\right)$.

(c) State and prove convolution theorem. (6+6+8)

21. Using Laplace transform solve the following differential equation:

$$\frac{d^2y}{dt^2} - 3\frac{dy}{dt} + 2y = \sin t \text{ given } y(0)=0 \text{ and } y'(0)=-1.$$

22. (a) Show that $F\{x^n f(x)\} = (-i)^n \frac{d^n}{ds^n} F\{f(x)\}$.

(b) Prove that (i) $F_c\{xf(x)\} = \frac{dF_s}{ds}$.

(ii) $F_s\{xf(x)\} = \frac{dF_c}{ds}$. (10+10)
