



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – MATHEMATICS

THIRD SEMESTER – APRIL 2016

MT 3504 – INTEGRAL TRANSFORMS & PARTIAL DIFF. EQUATIONS

Date: 02-05-2016

Dept. No.

Max. : 100 Marks

Time: 09:00-12:00

SECTION – A

Answer ALL questions

(10 × 2 = 20)

1. Find $\frac{\partial(u,v)}{\partial(x,y)}$ when $u = x^2 - y^2$; $v = x^2 + y^2$.
2. Form a partial differential equation by eliminating the arbitrary constants a and b in $z = (x + a)(x + b)$.
3. Find $L(\cos t \cos 2t)$.
4. State initial value theorem.
5. Find $L^{-1}\left(\frac{s}{s^2 + k^2}\right)$.
6. Write down the value of $L(y')$ and $L(y'')$.
7. Define the complex form of Fourier integral.
8. Show that $F\{f(x - a)\} = e^{-ias} F(s)$.
9. Define Fourier sine transform.
10. State Parseval's identity.

SECTION – B

Answer any FIVE questions.

(5 × 8 = 40)

11. Solve $p^2 + q^2 = m^2$.
12. Solve $p^2 + pq = z^2$.
13. Find $L\{\sin^2 t \cos^3 t\}$.
14. Find $L\{t^2 e^{3t} \sinh t\}$.
15. Find $L^{-1}\left\{\frac{s+3}{(s^2+6s+13)^2}\right\}$.
16. Find $L^{-1}\left\{\frac{1-s}{(s+1)(s^2+4s+13)}\right\}$.
17. Show that $F\{x^n f(x)\} = (-i)^n \frac{d^n}{ds^n} F\{f(x)\}$.
18. Find $F_C\{e^{-a^2x^2}\}$ and $F_S\{xe^{-a^2x^2}\}$.

SECTION – C

Answer any TWO questions

(2 × 20 = 40)

19 (a) Solve $(x^2 - yz) p + (y^2 - zx) q = z^2 - xy$.

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

20 Solve $y'' - 3y' + 2y = e^{2t}$, $y(0) = -3$, $y'(0) = 5$ using Laplace Transform.

21 (a) Find $L^{-1}\left(\frac{s}{s^4 + 4a^4}\right)$.

(b) Show that $F\left\{\frac{d^n}{dx^n}f(x)\right\} = (-is)^n F(s)$ and $F\left\{\overline{f(x)}\right\} = \overline{F(-s)}$.

22 (a) Prove that (i) $F_C\{xf(x)\} = \frac{dF_S}{ds}$. (ii) $F_S\{xf(x)\} = -\frac{dF_C}{ds}$.

(b) Show that $F_C\left\{\frac{1}{\sqrt{x}}\right\} = F_S\left\{\frac{1}{\sqrt{x}}\right\} = \frac{1}{\sqrt{s}}$.

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