LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRD SEMESTER – **NOVEMBER 2017**

16UMT3MC01– INTEGRAL TRANSFORMS AND PARTIAL DIFF. EQUATIONS

Date: 04-11-2017 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

SECTION – A

Answer ALL questions: **(10 × 2 = 20)**

1. Find L($e^{2t} + e^{-5t}$).
2. Find L(sin 3t sin 2t).
3. Compute: L^{-1} ($\frac{1}{(s+1)^2}$).
4. Find L^{-1} (sF(s)).
5. If Fs) = F{f(s)}, what is F{ e^{iax} f(x)}?
6. Show that if a>0 , F(f (ax)) = $\frac{1}{|a|} F\left(\frac{s}{a}\right)$.
7. Define Fourier Cosine transform.
8. State Parsival's identity.
9. Obtain a partial differential equation by eliminating a and b from z = ax+by+a.
10. Solve: x +y$\frac{\partial z}{\partial x}$ = 0.

SECTION – B

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

11. Find (i) L(t $\sin^2$ t) (ii) L(t^2 cos 4t).
12. Find L($\frac{\cos 3t - \cos 2}{t}$).
13. Find the inverse transform of $\frac{s-1}{2s^2+s+6}$.
14. Show that F { x^n f(x) } = $(-i)^n \frac{d^n}{ds^n}$F{f(x)}.
15. Compute: F_c { $\frac{1}{1+x^2}$ } and F_s { $\frac{x}{1+x^2}$ }.
16. Solve the integral equation $\frac{1}{2}\int_{-\infty}^{\infty} f(t)e^{-|x-t|}\,dt = h(x)$,where h(x) is the given function.
17. Solve: p+q = pq.
18. Solve: $p^3 + q^3$ = 8z.

SECTION – C

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

19 (a) Find the Laplace transform of (i) $\frac{e^{3t}-e^{-2t}}{t}$ (ii) $\frac{sin^2 t}{t}$.

(b) Find $L^{-1}\left\{\frac{s+3}{\left(s^2+6s+13\right)^2}\right\}$.

20 Using Laplace transform solve $\frac{d^2y}{dt^2} + 6\frac{dy}{dt} + 5y = e^{-2t}$ given that y=0, $\frac{dy}{dt}$=1 when t=0.

21 (a) If F is the Fourier transform show that

(i) F { af(x) +bg(x) } = a F{f(x)}+ b F{g(x)}

(ii) F{f(x-a)} = e^{ias} F(s).

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

22 (a) Find the complete solution of $1 + q^2 = p(z - b)$.

(b) Solve $p^2 + q^2 = z^2 (x + y)$.

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