



**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**

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

**THIRD SEMESTER – NOVEMBER 2013**

**MT 3504 – INTEGRAL TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS**

Date : 08/11/2013  
Time : 9:00 - 12:00

Dept. No.

Max. : 100 Marks

**PART – A**

Answer **ALL** questions:

(10 x 2 = 20)

1. State Lagrange's equation.
2. Form a partial differential equation from  $z = (x + a)(y + b)$ .
3. Define Laplace transform.
4. State the initial value theorem.
5. Find the inverse Laplace transform of  $\frac{s}{s+a}$ .
6. State any two properties of inverse Laplace transforms.
7. Define the complex form of the Fourier integral.
8. State the linearity property of Fourier transforms.
9. State the Modulation theorem.
10. State the Convolution theorem.

**PART – B**

Answer any **FIVE** questions:

(5 x 8 = 40)

11. Solve  $p^3 + q^3 = 8z$ .
12. Solve by Charpit's method:  $p^2 - xp - q = 0$ .
13. Find the Laplace transform of  $t \sin^2 t$ .
14. Find the Laplace transform of  $\left(\frac{\cos 3t - \cos 2t}{t}\right)$ .
15. Find  $L^{-1}\left(\frac{s^2}{(s^2 + 4)(s^2 + 9)}\right)$ .
16. Find  $L^{-1}\left(\log\left(\frac{1+s}{s}\right)\right)$ .
17. Find the Fourier sine transform of  $e^{-ax}/x$ .
18. Find the Fourier transform of  $e^{-x^2/2}$ .

**PART – C**

Answer any **TWO** questions:

(2 x 20 = 40)

19. a. Solve  $y^2p + x^2q = x^2y^2z^2$ .

b. Find the complete and singular solution of  $z = xp + yq + p^2 - q^2$ .

20. Solve using Laplace transforms  $\frac{d^2y}{dt^2} - \frac{dy}{dt} - 2y = 0$  given that  $y(0) = -2, y'(0) = 5$ .

21. a. Find  $L^{-1}\left(\frac{s-1}{2s^2+s+6}\right)$ .

b. State and prove Parseval's identity.

22. a. Show that  $F[f^n(x)] = (-is)^n F(s)$ .

b. State and prove the change of scale property of the Fourier sine and cosine transforms.

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