

B. Sc. DEGREE EXAMINATION, APRIL 2015  
BRANCH I – MATHEMATICS  
FOURTH SEMESTER

COURSE : MAJOR CORE  
PAPER : LAPLACE TRANSFORMS & PARTIAL DIFFERENTIAL EQUATIONS  
TIME : 3 HOURS MAX. MARKS : 100

SECTION – A

ANSWER ALL THE QUESTIONS: (10×2=20)

1. Find  $L[e^{at}]$ .
2. State the linear property of Laplace transform.
3. Find  $L^{-1}\left[\frac{1}{(s+2)^2+16}\right]$ .
4. Find  $L^{-1}\left[\frac{10}{(s+2)^6}\right]$
5. Form the PDE by eliminating the arbitrary constants from  $z = (x^2 + a)(y^2 + b)$ .
6. Form the PDE by eliminating the arbitrary function from  $z = f(x^2 - y^2)$ .
7. Find the complete integral of  $z = px + qy - pq$ .
8. Find the complete integral of  $p + q = \sin x + \sin y$ .
9. Solve  $r = a^2t$ .
10. Solve  $2r + 5s + 2t = 0$ .

SECTION – B

ANSWER ANY FIVE QUESTIONS: (5×8=40)

11. Find the Laplace Transforms of (i)  $t \sin^2 t$  (ii)  $\frac{\cos 3t - \cos 2t}{t}$
12. Evaluate (i)  $L^{-1}\left[\log\left(\frac{1+s}{s}\right)\right]$   
(ii)  $L^{-1}\left[\frac{1}{s(s^2+a^2)}\right]$
13. Find the Laplace transform of periodic function  $f(t) = \begin{cases} \sin t, & 0 < t < \pi \\ 0, & \pi < t < 2\pi \end{cases}$  with period  $2\pi$ .

14. Solve  $x^2p + y^2q = z^2$ .
15. Solve  $p^2z^2 + q^2 = 1$ .
16. Solve  $x^2p^2 + y^2q^2 = z^2$ .
17. Solve  $(D^2 + 3D'D + 2D'^2) = x + y$ .

## SECTION - C

ANSWER ANY TWO QUESTIONS:

(2×20=40)

18. Using Laplace Transforms Solve the the following simultaneous linear differential

equation  $\frac{dx}{dt} = 2x - 3y$ ,  $\frac{dy}{dt} = y - 2x$  given that  $x(0) = 8, y(0) = 3$ .

19. Solve (i)  $(x^2 - yz)p + (y - zx)q = z^2 - xy$   
 (ii)  $z^2(p^2x^2 + q^2) = 1$

20. Solve (i)  $(D^2 + 2DD' + D'^2)z = e^{2x+3y}$   
 (ii)  $r + p + 2s = 0$

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲