

**Avinashilingam Institute for Home Science and Higher Education for Women  
(Deemed to be University) Coimbatore – 641043**

**Bachelor's Degree Examination – November 2018**

**Class : II UG  
Major: Special Education & Rehabilitation  
and Mathematics**

**Time: 3 Hrs  
Max Marks: 100**

**15BSMC05 Differential Equations and Laplace Transforms**

**PART A**

**Choose the correct answers**

**10x1=10**

- Solutions of  $(D^2 + 2D + 1)y = 0$   
 a)  $(A + Bx)e^{-x}$                       b)  $(Ax + B)e^x$                       c)  $Ae^x + Be^x$                       d)  $Ae^x + Be^{2x}$
- Find the complementary solution of  $(D^2 - 3D + 5)y = 0$   
 a)  $e^{\frac{3}{2}x} \left( A \cos \frac{\sqrt{11}}{2}x + B \sin \frac{\sqrt{11}}{2}x \right)$                       b)  $A \cos x + B \sin x$   
 c)  $Ae^{-2x} + Be^{-x}$                       d)  $Ae^x + Be^{2x}$
- Obtain the PDE by eliminating  $p$  and  $q$  from  $z = px + qy - 2\sqrt{pq}$   
 a)  $z = ax + by - 2\sqrt{ab}$                       b)  $z = ax + by$   
 c)  $z = ax + by + a^2b$                       d)  $z = ax + by + 2\sqrt{ab}$
- The PDE obtained by eliminating the arbitrary function  $f$  from  $z = f(x^2 + y^2)$  is  
 a)  $px = qy$                       b)  $pq = xy$                       c)  $p + q = x + y$                       d)  $py = qx$
- $L(e^{at}) =$   
 a)  $\frac{1}{S - a}$                       b)  $\frac{1}{S + a}$                       c)  $\frac{a}{S^2 + a^2}$                       d)  $\frac{S}{S^2 + a^2}$
- $L(t^n) =$   
 a)  $\frac{n!}{S^{n+1}}$                       b)  $\frac{1}{S^{n+1}}$                       c)  $\frac{1}{S + n}$                       d)  $\frac{t^n}{n + 1}$
- $L^{-1} \left[ \frac{1}{(S + 1)(S + 3)} \right]$   
 a)  $\frac{1}{2(e^{-t} - e^{-3t})}$                       b)  $e^{2t} - e^t$                       c)  $e^t - e^{3t}$                       d)  $e^{-2t} \cos 3t$
- $L^{-1} \left( \frac{1}{S^2} \right) =$   
 a)  $t^2$                       b)  $t$                       c)  $t^{-2}$                       d)  $t^3$
- Laplace transform of  $\frac{d^2y}{dt^2} + \frac{4dy}{dt} - 5y = 5$  is  
 a)  $(s^2 + 4s + 5)L(y) + (s - 4)y(0) - y'(0) = 5/s$                       b)  $(s^2 + 4s - 5)L(y) - (s + 4)y(0) - y'(0) = 5/s$   
 c)  $(s^2 + 4s + 5)L(y) + (s - 4)y(0) - y'(0) = 5$                       d)  $(s^2 + 4s - 5)L(y) - (s + 4)y(0) - y'(0) = 5/s$
- If  $y'' + 5y' + 6y = e^{-t}$  given  $y(0) = 0, y'(0) = 0$  then  $L(y) =$   
 a)  $\frac{1}{(s + 1)(s + 2)(s + 3)}$                       b)  $\frac{1}{(s - 1)(s - 2)(s - 3)}$   
 c)  $\frac{1}{(s - 1)(s + 2)(s - 3)}$                       d)  $\frac{1}{(s + 1)(s - 2)(s + 3)}$

**Part B**  
**Answer the following**

**5 X 6=30**

11.a) Solve  $D^2 + 5D + 6)y = \sin 4x$

(or)

11.b) Solve  $D^2 - 6D + 9)y = e^{3x}$

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

(or)

12.b) Solve  $(y - z)p + (z - x)q = x - y$

13.a) Find  $L(\sin^2 2t)$

(or)

13.b) Find  $L\left(\frac{1}{\sqrt{t}}\right)$

14.a) Find  $L^{-1}\left[\frac{s+2}{s^2+4s+13}\right]$

(or)

14.b) Find  $L^{-1}\left[\frac{1}{s(s+1)}\right]$

15.a) Laplace transform  $y'' + 4y' + 3y = e^t$  given  $y(0) = 1$  and  $y'(0) = 0$

(or)

15.b) Laplace transform  $\frac{d^2y}{dt^2} + \frac{6dy}{dt} + 5y = e^{-2t}$  given  $y(0) = 0, y'(0) = 1$ .

**Part C**  
**Answer the following**

**5 x 12=60**

16. a) Solve  $(D^2 - 4D + 3)y = e^{-x} \sin x$ .

(or)

16. b) Solve  $(D^2 + 2D + 5)y = xe^x$

17.a) Solve  $x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} = x$

(or)

17.b) From the PDE by eliminating the function  $f$  from  $z = f(x^2 - y^2)$

18.a) Find (i)  $L(t^2 \cos 2t)$  (ii)  $L[t e^{-t} \sin t]$

(or)

18. b) Find (i)  $L(\sqrt{t})$  (ii)  $L[t e^{-4t} \sin 3t]$

19.a)  $L^{-1}\left(\frac{1}{s^2+5s+6}\right)$

(or)

19.b)  $L^{-1}\left(\frac{1}{(s+1)(s+2)}\right)$

20.a) Solve  $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} - 5y = 5$  given  $y(0) = 0, y'(0) = 2$  by using Laplace transform.

(or)

b) Solve  $y'' - 3y' + 2y = \sin t$  given  $y(0) = 0, y'(0) = 1$ . using Laplace transform.