Differential equations and Lap Lace Transforms

Section – A

UNIT – I

1. Solve. $\left(\frac{dy}{dx}\right)^2 - ax^2 = 0$
2. Solve. $P = \log(px - y)$
3. Verify whether $(x^2y - 2xy^2)dx - (x^3 - 3x^2y)dy = 0$ is exact.
4. Solve. $xyp^2 + p(3x^2 - 2y^2) - 6xy = 0$
5. Solve. $a(x\ \mathrm{dy}+2\mathrm{y}\ \mathrm{dx}) = xy\ \mathrm{dy}$
6. Solve. $\mathrm{y}=(\mathrm{x}\text{-}\mathrm{a})\, p - p^2\, 1.$
7. Solve $p^3 - 7p - 6 = 02.$
8. Define periodic function .
9. Define particular Integrals
10. Define Legrange's equation.
11. Define non-homogeneous.
12. Solvable for $P^2 - 3P + 2 = 0$
13. Solvable for $x = y + a \log P$

SECTION – B

1. Solve. $P^2 + \left(x + y - \frac{2y}{x}\right)P + xy + \frac{y^2}{x^2} - y - \frac{y^2}{x} = 0$
2. Solve. $(a^2 - 2xy - y^2)dx - (x + y)^2 dy = 0$
3. Solve. $y^2 \log y = xpy + p^2$
4. Solve. $x = yp + ap^2$
5. Solve. $y(xy + 2x2y^2)dx + x(xy - x2y^2)dy = 0$
6. Solve. $(D2 - 4D + 3)y = \sin 3x \cos 2x$

7. 11.Solve $x = tan^{-1}(p) + \frac{p}{1+p^2}$.

8. Solve $\frac{dy}{dx} + \frac{y\cos x+\sin y+y}{\sin x+x\cos y+x} = 0$

9. $(D^3+3D^2+3D+1)\, y = e^{-x}$

10. Solve $(D^2-4D+4) = e^{2x} + \cot 2x$.

SECTION -C

1. Solve $(D^2+5D+4)y = x^2+7x+9$

2. Solve. $(i)\, x - yp = ap_2\ (ii)\, y^2 = (1+p^2)$

3. Solve. $(i)\, xy(y-px) = x+yp\ (ii)\, x^2p^2 - 2xyp + 2y^2 - x^2 = 0$

4. Solve. $(y^2+2x^2y)dx + (2x^2-xy)dy = 0$.

5. Find the general solution integral and singular solution of the equation

6. $y = x\frac{dy}{dx} + \frac{a\frac{dy}{dx}}{\sqrt{1+(\frac{dy}{dx})2}}$.

7. Solve $x = \tan^{-1}(P) + \frac{P}{1+P^2}$.

8. Solve $(D^2+9)\, y = (x^2+1)\, e^{3x}$

UNIT – II

1. Solve. $(D^4 - D^3 - 9D^2 - 11D - 4)y = 0$

2. Find the particular integral of $(4D^2+12D+9)y = 144e^{-3x}$

3. Solve. $(D^4 - 4D^3 + 8D^2 - 8D + 4)y = 0$

4. $(D^4 + 2D^2n^2 - n^4)y = \cos mx$ Find the particular integrals.

5. Solve. $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 0$

6. Find the particular integral of

7. $\left(D^2+5D+6\right)y=e^x$

8. Solve$(D^2-6D+5)y=e^{2x}$.

9. Define clairauts equation.

10. Define Exact equation.

SECTION- B

1. Solve $(D^2-6D+5)\ y=e^{2x}$.

2. Solve. $y=xp+x\left(1+p^2\right)1/2$

3. Solve. $\left(D^3-D^2-D+1\right)y=1+x^2$

4. Solve. $\left(D^3-D\right)y=2\cosh x$

5. Solve. $\left(D^3+8\right)y=x^4+2x+1$

6. Solve. $\left(D^2-4D+3\right)y=\sin 3x\cos 2x$

7. Solve. $3x^2\dfrac{d^2y}{dx2}+x\dfrac{dy}{dx}+y=x$

8. Solve $(D^2-2D+1)\ y=x\ e^x \sin x$.

9. Solve $(D^2+6D+8)\ y=e^{-2x}+\cos^2 x$.

10. Solve $p^2+q^2=4$.

11. Solve$(D+D')2=e^{x-y}$

12. Solve (D^2-DD')=Sinx Sin2y.

SECTION-C

1. Solve the equation $\dfrac{d^2y}{dx^2}+y=\sec x$ using method of variation of parameters.

2. Solve $\left(D^2-2D+2\right)y=e^x\tan^x$ by the method variation of parameter.

3. Solve. $(1-x)y^3+(x^2-1)y^2-x^2y1+xy=0$

4. Solve $\frac{d^2y}{dx^2}+4y=4\tan 2x$ *using method of variation parameter*

.

5. Solve $(D^2-D'^2)$ Z = XY Satisfying the continuous $\frac{\partial z}{\partial Y}=0$

where y =0.

6. Solve $\frac{dy}{dx}+\frac{y\cot x+Sin\ y+y}{Sin\ x+x\ Cos\ y+x}=0$

UNIT – III

1. Solve. $\frac{d^2z}{dy^2}=\sin y$

2. Form the PDE by eliminating the arbitrary function from $z=f\left(x^2-y^2\right)$

3. Find the complete integral of $z=px+qy+c\sqrt{1+p^2+q^2}$

4. Eliminate a and b from $\frac{x^2+y^2}{a^2}+\frac{z^2}{b^2}=1$ and find partial differential equation.

5. Solve. PQ = K.

6. Define PDE.

7. Solve$(D^3-4D^2D'+4DD'^2)$ Z=0.

8. Define particular Integrals

<u>**UNIT – IV**</u>

1. Solve. $\left(D^2 + DD'2D^{12}\right)z = 0$

2. Find the complete integral of $\left(D^2 - D^{12}\right)Z = e^{x+y}$

3. Sole. $\left(D^3 - 4D^2D' + 4DD'^2\right)z = 0$

4. Find the complete integral of $z = px + qy + c\sqrt{1 + p^2 + q^2}$

5. Solve. $\dfrac{d^2z}{dy^2} = \sin y$

6. Define Complete Integrals. .

7. Define particular Integrals

8. $\left(D^2 + 5D + 6\right)y = e^x$

SECTION-B

1. Solve(D^2-6D+5)y=e^{2x}. Solve. $\dfrac{\partial^2 z}{\partial x^2} a^2 z$ given that when $x = 0, \dfrac{\partial z}{\partial x} = a\sin y$ and $\dfrac{\partial z}{\partial y} = 0$

2. Solve. $p\left(1 + q^2\right) = q\left(z - 1\right)$ 13.Form the PDE by eliminating arbitrary constant from log (az-1) = x +ay +b.

3. Solve $x^2\frac{d^2y}{dx^2} - x\ \frac{dy}{dx} + y = 2\log x$.

4. Solve. $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} + \dfrac{z^2}{c^2} = 1$

5. Find the partial differential equation by Eliminating a, b, c from $x\left(y^2 + z\right)p - y\left(x^2 + z\right)q = z\left(x2 - y^2\right)$

6. Solve. $\left(y + z\right)p + \left(z + x\right)q = x + y$

7. Solve. $q = xp + p^2$.

8. Form the PDE by eliminating arbitrary constant from

9. z =x $f_1(x + t) + f_2 (x + t)$.

10. Solve $3p^2 - 2q^2 = 4pq$

11. Solve $p^2+q^2=4$.

12. Solve $p^2+q^2=npq$.

13. Solve $p^2+q^2=x+y$

SECTION -C

1. Solve $px\left(y^2+z\right)-qy\left(x^2+z\right)=z\left(x^2-y^2\right)$

2. Find the surface that contains the straight line x + y=0, z=1

3. Find the complete Integral of pxy + pq +qy = yz

4. Solve. $x^2\frac{\partial^2}{\partial x}+y^2\frac{\partial z}{\partial y}=\left(x+y\right)z$ Solve Z = Px + qy +$\sqrt{1+p^2+q^2}$

5. Solve Z = Px + qy +$\sqrt{1+p^2+q^2}$

6. Solve $\frac{\partial^2 z}{\partial x^2}+3\frac{\partial^2}{\partial x\partial y}+2\frac{\partial^2 z}{\partial y^2}=x+y$.

UNIT – IV

1. Solve. $\left(D^2+DD'-2D'^2\right)z=0$

2. Write the particular integral of $\left(D^2-DD'\right)z=\sin\left(x+y\right)$.

3. Find the particular integral of $\left(D^2-2DD'+D'^2\right)z=e^{2x+3y}$

4. Find the complete integral of $\left(D^2-D'^2\right)z=e^{x+y}$

5. Define laplace Transform.

6. Define periodic function Solve. $\left(D^2-DD'\right)z=\sin x\sin 2y$

7. Solve. $\left(D^2-DD'+D'\right)z=2x+3y$

8. Solve. $\frac{\partial^2 x}{\partial x^2}+\frac{\partial^2 z}{\partial y^2}=\cos mx\cos ny$

9. Solve. $\left(2D2+5DD'+2D1'\right)z=24\left(y-x\right)$

SECTION –B

1. Solve. $\frac{\partial^2 z}{\partial x^2}+\frac{4\partial^2 z}{\partial d\partial y}+4\frac{\partial^2 z}{\partial y^2}=e^{2x-y}$

2. Solve. $\left(D^2-4D'^2\right)z=\cos 4x\cot 3y$. Form the PDE by eliminating arbitrary constant from

   z =x f_1(x + t) +f_2 (x + t).

3. Solve 3 p^2- 2q^2 = 4pq

4. Solve(D+D')2=e^{x-y}

5. Solve ($D^2 - DD'$)=Sinx Sin2y.

6. Solve(D+D')2=e^{x-y}

SECTION-C

1. Solve ($D^2 - DD'$)=Sinx Sin2y.

2. Solve. $\left(D^2-DD'+D'_2\right)z=2x+3y$

3. Solve. $\left(D^2-DD'+D'^2\right)z=2x+3y$

4. Solve. $\left(D^2-6DD'+5D'^2\right)z=ex\sinh y+xy$

5. Solve p^2- q^2 = n pq .

6. Solve ($D^2 - D'^2$) Z = XY Satisfying the continuous $\frac{\partial z}{\partial Y}=0$ where y =0.

UNIT – V

SECTION -A

1. Find $\left[Sin^2 2t\right]$

2. Find $L^{-1}\left[\frac{1}{S(S+a)}\right]$

3. Find $L\left[\frac{\sin at}{t}\right]$

4. Find $L^{-1}\left[\frac{s}{s^2+k^2}\right]$

5. Prove that $L\left[f'(t)\right]=SL\left[f(t)-f(0)\right]$

SECTION-B

1. Find $L^{-1}\left[\frac{1}{(s+a)^2}\right]$ Find $L\left[f(t)\right]=\begin{cases}1 & 0<t<b\\ -1 & b<t<26\end{cases}$

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

3. Find $L\left[t^2+\cos 2t+\sin 2t\right]$

4. Find $L^{-1}\frac{s^2-s+2}{s(s-3)(s+2)}$

5. Find $L^{-1}\left[\frac{1+2s}{(s+2)^2(s-1)^2}\right]$

6. Find $L^{-1}\left[\frac{s+2}{\left(s^2+4s+5\right)^2}\right]$.

SECTION-C

1. State and prove first shifting theorem .

2. Find L^{-1}[log $\frac{s-a}{s^2+a^2}$]

3. Solve $\frac{d^2y}{dt^2}+2\frac{dy}{dt}+dy=4e^{-1}$ given that $y=\frac{dy}{dt}=0,$ when t=0

4. Solve. $t\frac{d^2y}{dt^2}-(2+t)\frac{dy}{dt}+3y=t-1$ when $\text{y}(0)=0$

5. Solve $\frac{d^2y}{dt^2}+2\frac{dy}{dt}+5y=4e^{-t}$ given that $y=\frac{dy}{dt}=0$ when t=0 .

6. State and prove convolution theorem.