Unit - I I year - II - Semister

Shazia. - Maths

Short Questions

1) Explain the working Rule for exact & solve $(1+e^{x/y})dx + e^{x/y}(1-\frac{x}{y})dy = 0$

2) Solve $x^2y\,dx - (x^3+y^3)dy = 0$

3) solve $y(1+xy)dx + x(1-xy)dy = 0$

4) solve $(y^4+2y)dx + (xy^3+2y^4-4x)dy = 0$

5) solve $\frac{dy}{dx} + (2x\tan^{-1}y - x^3)(1+y^2) = 0$

6) solve $3x^2dx + 3y^2dy - (x^3+y^3+e^{2z})dz = 0$

7) solve $(y-xp)(p-1) = p$

8) solve $xy^2(p^2+2) = 2py^3 + x^3$ where $p = \frac{dy}{dx}$

9) solve $(x^2+y^2+2x)dx + 2y\,dy = 0$

10) solve $x\,dy - y\,dx = xy^2\,dx$ (Hint:- dividing by y^2)

Long Questions

1) If $M(x,y)dx + N(x,y)dy = 0$ is a homogenous differential eq^n & $Mx+Ny \neq 0$, then S.T $\frac{1}{Mx+Ny}$ is an integrating factor of $Mdx + Ndy = 0$

2) solve $y(xy+2x^2y^2)dx + x(xy - x^2y^2)dy = 0$

3) solve $(2x^2y - 3y^4)dx + (3x^3 + 2xy^3)dy = 0$

4) solve $\sec^2 y \frac{dy}{dx} + 2x\tan y = x^3$

5) solve $\frac{dz}{2xz} = \frac{dy}{2xy} = \frac{dx}{x^2-y^2-z^2}$

6) solve $\frac{dx}{x(y^2-z^2)} = \frac{dy}{y(z^2-x^2)} = \frac{dz}{z(x^2-y^2)}$

7) solve $p^2 + 2py\cot x = y^2$ where $p = \frac{dy}{dx}$

8) solve $y^2 \log y = apy + p^2$ where $p = \frac{dy}{dx}$

9) solve $2px = 2\tan y + p^3 \cos^2 y$

10) solve $y + px = p^2 x^4$

Unit - II

1) solve $(D^2 - 3D + 2)y = \cosh x$

2) solve $(D^2 - p^2)y = \sinh px$

3) solve $\frac{d^2y}{dx^2} + 4y = e^x + \sin 2x + \cos 2x$

4) solve $(D^2 + 9)y = \cos^3 x$

5) solve $(D^2 - 4D + 3)y = \sin 3x \cos 2x$

6) solve $(D^2 - 3D + 2)y = \cos 3x \cos 2x$

7) solve $(D^2 + D + 1)y = (1 + \sin x)^2$

8) solve $(D^4 + D^2)y = 3x^2 + 4\sin x - 2\cos x$

9) Solve $(D^2-2D+4)y = 8(x^2+e^{2x}+\sin 2x)$

10) $(D^2-3D+2)y = e^{4x}+\sin 3x + x^2+x$

11) $D^2(D^2+4)y = 320(x^3+2x^2)$

12) $(D^4-a^4)y = x^4+\sin bx$

13) solve $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 13y = 8e^{2x}\sin 2x$

14) solve $(D^2-4D+3)y = 2xe^{3x} + 3e^x\cos 2x$

15) solve $(D^2+2)y = x^2e^{3x} + e^x\cos 2x$

16) Explain the working Rule to find the P.I of $\frac{1}{f(D)}x^k$, $\frac{1}{f(D)}e^{ax}V$, $\frac{1}{f(D)}e^{ax}$, $\frac{1}{f(D)}\cos bx$ or $\sin bx$.

Unit – III

→① Explain the W.R. to find the G.S. of $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = R$ by the method of Variation of parameters.

2) Solve $(D^2+a^2)y = \sec ax$ by the method of Variation of parameters

2) Solve $(D^2+a^2)y = \tan ax$ by the method of V.P.

3) Solve $(D^2+1)y = \operatorname{cosec} x$ by method of V.P.

4) Solve $y'' - 2y' + y = e^x \log x$ by method of V.P

5) solve $(x^2D^2 - xD + 1)y = 2\log x$

6) solve $(x^2D^2 + 2xD - 20)y = (x+1)^2$

7) solve $(x^2D^2 - xD - 3)y = x^2 \log x$.

8) solve $(x^3D^3 + 3x^2D^2 + xD + 8)y = 65\cos(\log x)$

9) solve $x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 5y = x^2\sin(\log x)$

10) Explain the working Rule to solve $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = R$.

11) Solve $\frac{d^2y}{dx^2} - (\cot x)\frac{dy}{dx} - (1-\cot x)y = e^x \sin x$.

12) $xy'' - 2(x+1)y' + (x+2)y = (x-2)e^{2x}$

13) $(x+2)y'' - (2x+5)y' + 2y = (x+1)e^{x}$ given that $y = e^{2x}$ is a part of C.F.

14) solve $(D^2+3D+2)y = \sin x$ by the method of undetermined coefficients

15) Solve $(D^2-3D)y = 2e^{2x}\sin x$ by the method of undetermind coefficients.

16) Solve $(D^2+4D+4)y = 4x^2+6e^{x}$ by the method of undetermind coefficients

Unit - IV

Short Question

1) Form the partial differential eq^n by eliminating the arbitrary constants $z = (x^2+a)(y^2+b)$

2) Form the p.d.e. by eliminating the arbitrary constants A & P from $z = Ae^{-p^2t}\cos(px)$

3) Form the p.d.e. by eliminating the arbitrary ~~con~~ function from

(i) $\phi(x^2+y^2+z^2, z^2-2xy)=0$ (ii) $\phi\left(\frac{z}{x^3}, \frac{y}{x}\right)=0$

(iii) $\phi(z-xy, x^2+y^2)=0$ (iv) $F(xy+z^2, x+y+z)=0$

4) solve the following p.d.e. by direct integration

(i) $\frac{\partial^2 z}{\partial x \partial y} = 2x+2y$ (ii) $\frac{\partial^2 z}{\partial x \partial y} = \frac{1}{xy}$ (iii) $\frac{\partial^2 z}{\partial x \partial y} = e^y \cos x$.

5) solve $\frac{\partial^2 z}{\partial x \partial y} = e^{-y}\cos x$ by direct integration when $x=0$ and when $y=0, z=0$

$\frac{\partial z}{\partial y} = 0$

6) solve $pq = 1$

7) solve $p^3 = qz$

8) solve $p(1+q) = qz$

9) solve $pe^y = qe^x$

10) solve $\sqrt{p} + \sqrt{q} = x+y$

11) Solve $p+q = \sin x + \sin y$

12) Solve $p^2 - q^2 = x - y$

13) Solve $z = px + qy + pq$

14) Solve $(p+q)(z - px - qy) = 1$

Long questions.

1) Solve $pxy + pq + qy = yz$ by charpits method

2) Find the complete integral of $p^2 - y^2q = y^2 - x^2$

3) Find the complete integral of $z = px + qy + p^2 + q^2$

4) Solve $p\tan x + q\tan y = \tan z$

5) Solve $x(z^2 - y^2)p + y(x^2 - z^2)q = z(y^2 - x^2)$

6) Solve $(x^2 - y^2 - yz)p + (x^2 - y^2 - zx)q = z(x - y)$

7) Solve $\frac{\partial^3 z}{\partial x^3} - 3\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial y^3} = e^{x+2y}$

8) Solve $\frac{\partial^2 z}{\partial x^2} - 4\frac{\partial^2 z}{\partial x \partial y} + 4\frac{\partial^2 z}{\partial y^2} = e^{2x+y}$

9) Solve $4\frac{\partial^2 z}{\partial x^2} - 4\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = 16\log(x+2y)$

10) Solve $2\frac{\partial^2 z}{\partial x^2} - 5\frac{\partial^2 z}{\partial x \partial y} + 2\frac{\partial^2 z}{\partial y^2} = 5\sin(2x+y)$

11) Solve $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} - 6\frac{\partial^2 z}{\partial y^2} = \cos(2x+y)$