UNIT-I(MTRIX)

1. Find the rank of the Matrix

$(1)\begin{bmatrix}1&3&4&3\\3&9&12&3\\5&15&20&9\end{bmatrix}(2)\begin{bmatrix}5&6&7&8\\6&7&8&9\\11&12&13&14\\16&17&18&19\end{bmatrix},(3)\begin{bmatrix}2&3&-1&-1\\1&-1&-2&-4\\3&1&3&-2\\6&3&0&-7\end{bmatrix},(4)\begin{bmatrix}2&3&4&-1\\5&2&0&-1\\-4&5&12&-1\end{bmatrix},(5)\begin{bmatrix}1&2&3&4\\2&3&4&5\\7&11&15&19\\9&15&21&57\end{bmatrix},(6)\begin{bmatrix}1&2&3&0\\1&4&3&2\\3&2&1&3\\6&8&7&5\end{bmatrix},$

$(7)\begin{bmatrix}2&3&10&4\\3&12&7&1\\4&-13&-2&-2\\5&4&3&-15\end{bmatrix},(8)\begin{bmatrix}1&2&1\\2&3&4\\1&3&-1\\8&13&14\end{bmatrix},(9)\begin{bmatrix}1&1&1&1\\-1&1&1&-1\\1&0&1&1\\1&1&0&1\end{bmatrix},(10)\begin{bmatrix}1&3&5\\2&-1&4\\-2&8&2\end{bmatrix},(11)\begin{bmatrix}1&2&3&4\\2&1&4&5\\1&5&5&7\\8&1&14&17\end{bmatrix},(12)\begin{bmatrix}3&1&7\\1&2&4\\4&-1&7\\4&-1&5\end{bmatrix},$

$(13)\begin{bmatrix}1&1&-1&1\\-1&1&-3&-3\\1&0&1&2\\1&-1&3&3\end{bmatrix},(14)\begin{bmatrix}2&0&-1\\5&0&0\\0&1&3\end{bmatrix},(15)\begin{bmatrix}1&-2&3\\2&1&2\\5&-5&11\end{bmatrix},(16)\begin{bmatrix}2&1&-2\\-1&-1&1\\3&1&-2\end{bmatrix},(17)\begin{bmatrix}1&2&-1&1\\2&3&4&5\\1&4&-13&-5\end{bmatrix},(18)\begin{bmatrix}1&-2&1&-1\\1&1&-2&3\\4&7&-5&8\end{bmatrix},$

$(19)\begin{bmatrix}1&2&3&4\\2&3&4&5\\7&11&15&19\\9&15&21&27\end{bmatrix},(20)\begin{bmatrix}2&0&-1&0\\4&1&0&5\\0&1&3&6\\6&1&-2&6\end{bmatrix}(21)\begin{bmatrix}2&3&1&0&4\\3&1&2&-1&1\\4&-1&3&-2&-2\\5&4&3&-1&5\end{bmatrix}(22)\begin{bmatrix}1&2&3&2\\-1&1&3&-5\\2&3&4&5\end{bmatrix}(23)\begin{bmatrix}1&2&-3\\2&1&-1\\1&-1&2\\5&4&-2\end{bmatrix}(24)\begin{bmatrix}2&3&1&0&4\\3&1&2&-1&1\\4&-1&3&-2&-2\\5&4&3&-1&5\end{bmatrix}$

$(25)\begin{bmatrix}1&1&2\\3&4&-7\\-1&-2&11\end{bmatrix}(26)\begin{bmatrix}3&-11&5\\4&1&-10\\4&9&-6\end{bmatrix}(27)\begin{bmatrix}1&2&3&4\\1&1&1&1\\1&2&6&12\end{bmatrix}(28)\begin{bmatrix}2&-1&-3&1\\1&1&1&1\\2&-7&-13&-1\\-1&5&9&1\end{bmatrix}(29)\begin{bmatrix}1&1&1&1\\-1&1&1&-1\\-1&-1&1&1\\1&1&-1&1\end{bmatrix}(30)\begin{bmatrix}3&1&1&4\\0&4&10&1\\1&7&17&3\\2&2&4&3\end{bmatrix}$

$(31)\begin{bmatrix}1&1&-3&2\\2&-1&-2&-3\\3&0&-5&-1\\5&-1&-7&-4\end{bmatrix}(32)\begin{bmatrix}1&-2&1&-1\\1&1&-2&3\\4&1&-5&8\\5&-7&2&-1\end{bmatrix}(33)\begin{bmatrix}1&1&-2&-1\\2&1&1&-2\\3&2&-1&-3\\4&2&2&-4\end{bmatrix}(34)\begin{bmatrix}-1&1&1&1\\1&-1&1&1\\1&1&-1&1\\1&1&1&-1\end{bmatrix}(35)\begin{bmatrix}1&1&0&1\\1&1&1&1\\4&4&1&1\\1&0&0&1\end{bmatrix}$

2. Find all the eigen values and the corresponding eigen vectors of the Matrices and verify the Cayley-Hamilton theorem and find A^{-1} if it exists, also find the modal matrix P which diagonalise A,if it exist,and show that A=P^{-1}DP.

$(36)\begin{bmatrix}1&2&3\\3&1&0\\-2&0&1\end{bmatrix},(37)\begin{bmatrix}1&1&i\\1&0&i\\-i&-i&1\end{bmatrix}(38)\begin{bmatrix}0&2&-2&0\\1&1&0&-1\\-1&1&-2&1\\-1&1&-2&1\end{bmatrix}(39)\begin{bmatrix}3&-1&1\\-1&5&-1\\1&-1&3\end{bmatrix}(40)\begin{bmatrix}-2&2&-3\\2&1&-6\\-1&-2&0\end{bmatrix}$

$(41)\begin{bmatrix}1&2&3&4\\2&1&4&3\\3&4&2&1\\4&3&1&2\end{bmatrix}(42)\begin{bmatrix}1&i&i\\i&1&i\\i&i&1\end{bmatrix}(43)\begin{bmatrix}8&-6&2\\-6&-7&-4\\2&-4&3\end{bmatrix}(44)\begin{bmatrix}6&-2&2\\-2&3&-1\\2&-1&3\end{bmatrix}(45)\begin{bmatrix}1&4\\3&2\end{bmatrix}\begin{bmatrix}1&1\\-1&1\end{bmatrix}$

$(46)\begin{bmatrix}1&0&0\\0&2&1\\2&0&3\end{bmatrix}(47)\begin{bmatrix}3&1&-1\\-2&1&2\\0&1&2\end{bmatrix}(48)\begin{bmatrix}-2&2&-3\\2&1&-6\\-2&-2&0\end{bmatrix}(49)\begin{bmatrix}1&0&-4\\0&5&4\\-4&4&3\end{bmatrix}(50)\begin{bmatrix}3&2&1\\0&2&0\\1&2&3\end{bmatrix}$

$(51)\begin{bmatrix}1&-2&1\\2&3&-2\\3&1&-1\end{bmatrix}(52)\begin{bmatrix}1&-1&-1\\1&-1&0\\1&0&-1\end{bmatrix}(53)\begin{bmatrix}1&3&3\\1&4&3\\-1&3&4\end{bmatrix}(54)\begin{bmatrix}1&1&i\\1&0&i\\-i&-i&1\end{bmatrix}(55)\begin{bmatrix}0&i&i\\i&0&i\\i&i&0\end{bmatrix}$

$(56)\begin{bmatrix}0&1&0&0\\0&0&1&0\\0&0&0&1\\0&0&0&0\end{bmatrix}(57)\begin{bmatrix}0&2&-2&0\\1&1&0&-1\\-1&1&-2&1\\-1&1&-2&1\end{bmatrix}(58)\begin{bmatrix}0&1&1&1\\1&0&1&1\\1&1&0&1\\1&1&1&0\end{bmatrix}(59)\begin{bmatrix}0&0&0&0&1\\0&0&0&1&0\\0&0&1&0&0\\0&1&0&0&0\\1&0&0&0&0\end{bmatrix}$

$(60)\begin{bmatrix}-3&-2&1\\-2&0&4\\-1&-3&5\end{bmatrix}(61)\begin{bmatrix}0&2&1\\2&0&3\\1&-3&0\end{bmatrix}(62)\begin{bmatrix}5&-6&-6\\-1&4&2\\3&-6&-4\end{bmatrix}(63)\begin{bmatrix}1&1&1\\1&1&1\\1&-1&1\end{bmatrix}(64)\begin{bmatrix}1&2&-2\\1&1&1\\1&3&-1\end{bmatrix}$

3.Find the Matrix A whose eigen values and the corresponding eigen vectors are as given

(65) 2,2,4 $\rightarrow$ $(-2,1,0)^T,(-1,0,1)^T,(1,0,1)^T$,(66) 1,-1,2 $\rightarrow$ $(1,1,0)^T,(1,0,1)^T,(3,1,1)^T$,

(67)1,2,3 $\rightarrow$ $(1,2,1)^T,(2,3,4)^T,(1,4,9)^T$,(68) 1,1,1 $\rightarrow$ $(-1,1,1)^T,(1,-1,1)^T,(1,1-1)^T$,

(69)0,-1,1 $\rightarrow$ $(-1,1,0)^T,(1,0,-1)^T,(1,1,1)^T$,(70)0,0,3 $\rightarrow$ $(1,2,-1)^T,(-2,1,0)^T,(3,0,1)^T$

4.Determine whether the following set of vectors is Linearly independent or Linearly dependent

(71) $\{(1,1,1)(i,i,i)(1+i,-1-i,i)\}$ **(72)** $\{(1,1,0,1)(1,1,1,1)(4,4,1,1)(1,0,0,1)\}$ **(73)** $\{(4,2,1)(2,3,2)(1,1,4)\}$

(74) $\{(1,2,3,4)(0,1,-1,2)(1,4,1,8)(3,7,8,14)\}$ **(75)** $\{(3,2,7)(2,4,1)(1,-2,6)\}$

5.Reduce the following Quadratic forms into Canonical form and find rank, Index, Signature, and nature

$(81) 2x_1^2+2x_2^2+2x_3^2-2x_1x_2-2x_2x_3-2x_3x_1, (82) 2x^2+5y^2-6z^2-2xy-yz+8zx, (83) x_1^2-(2+4i)\,x_1x_2-(4-6i)\,x_2x_3+x_2{}^2$

$(84) x_1^2+2x_2^2+3x_3^2+4x_4^2+2x_1x_2+4x_1x_3-6x_1x_4-4x_2x_3-8x_2x_4+12x_3x_4, (85) x_1^2+7x_2^2+26x_3^2+4x_1x_2-22x_2x_3-2x_3x_1$

$(86) x^2-4y^2+6z^2+2xy-4xz+2\omega^2-6z\omega, (87) 3x^2+3z^2+4xy+8xz+8yz, (88) 8x^2+7y^2+3z^2-12xy+4xz-8yz$

$(89) 6x_1^2+3x_2^2+3x_3^2-4x_1x_2-2x_2x_3+4x_3x_1, (90) x_1^2+2x_1x_2-4x_1x_3+6x_2x_3-5x_2^2+4x_3^2, x_1^2+2i\,x_1x_2-8x_1x_3+4i\,x_2x+4x_3^2$

$(91) 2x_1^2-3x_2^2+(6+8i)\,x_1x_2+(4-2i)\,x_2x_3, (92) x_1^2+7x_2^2+7x_3^2+4x_1x_2-18x_2x_3-6x_3x_1$

6.Using Matrix Method solve the system of equation

$(100) 5x+3y+7z=4,\ 3x+26y+2z=9,\ 7x+2y+10z=5, (101) 2x_1-x_2+x_3=4,\ x_1+x_2+x_3=1,\ x_1-3x_2-2x_3=2$

$(102) x-y+z=4,\ 2x+y-3z=0,\ x+y+z=2, (103) x_1-x_2+3x_3=3,\ 2x_1+3x_2+x_3=2,\ 3x_1+2x_2+4x_3=5$

$(104) 4x+9y+3z=6, 2x+3y+z=2, 2x+6y+2z=7, (105) -x+y+2z=2,\ 3x-y+z=3,\ -x+3y+4z=6$

$(106) 2x-z=1,\ 5x+y=7,\ y+3z=5, (107) x+2y+3z=6,\ 2x+4y+z=7,\ 3x+2y+9z=14$

$(108) 4x+3y-z=0, 3x+4y+z=0, x-y-2z=0, 5x+y-4z=0, (109) 3x+y+2z=3, 2x-3y-z=-3, x+2y+z=4,$

$(110) 3x+4y-z-6t=0, 2x+3y+2z-3t=0, 2x+y-14z-9t=0, x+3y+13z+3t=0,$

$(111) x+y+z=3, x+2y+3z=4, x+4y+9z=6, (112) x+2y+3z=1, 3x-y+z=2, 4x+2y+z=3$

$(113) x+2y+3z=1, 2x+3y+8z=2, x+y+z=3, (114) 4x+2y-z=9, x-y+3z=-4, 2x+z=1,$

$(115) 5x+3y+3z=48, 2x+6y-3z=18, 8x-3y+2z=21, (116) x+y+z=6, x-y+2z=5, 3x+y+z=8,$

$(117) x+2y-3z=1, 3x-2y+z=2, 4x+2y+z=3, (118) 9x+4y+3z=-1, 5x+y+2z=1, 7x+3y+4z=1,$

$(119) x+y+z=8, x-y+2z=6, 9x+5y-7z=14, (120) 3x+2y+4z=7, 2x+y+z=4, x+3y+5z=2,$

$(121) 4x+3y-z=0, 3x+4y+z=0, x-y-2z=0, 5x+y-4z=0, (122) 2x+3y+4z=11, x+5y+7z=15, 3x+11y+13z=25,$

$(123) 4x+3y-z=0, 3x+4y+z=0, x-y-2z=0, 5x+y-4z=0, (124) 5x+3y+7z=4, 3x+26y+2z=9, 7x+2y+10z=5$

$(125) 4x+3y-z=0, 3x+4y+z=0, x-y-2z=0, 5x+y-4z=0, (126) 2x-3y+z=-2, x-y+2z=3, 2x+y-3z=-2,$

$(127) x+4y+7z=1, 2x+5y+8z=2, x+2y+3z=1, (128) x-4y+7z=8, 3x+8y-2z=6, 7x-8y+26z=3,$

$(129) x+y+z=3, 3x-9y+2z=-4, 5x-3y+5z=6, (130) x+y+z=7, x+2y+3z=16, x+3y+4z=22,$

$(131) 2x-3z=0, 2y-3z=0, x-y+z=1, (132) 5x+3y+14z=4, y+2z=1, x+y+2z=0, 2x+y+6z=2,$

$(133) x-2y+z+2w=1, x+y-z+w=2, x+7y-5z-w=4, (134) x+y+z+w=4, x+y+z-w=2, x-y+z-w=0,$

$(135) -x+y+z+w=1, x-y+z+w=0, x+y-z+w=0, x+y+z-w=0 (136) 2x+3y+5z=9, 7x+3y-2z=8, 2x+3y+z=0,$

$(137) x+y+z=6, x+2y+5z=10, 2x+3y+z=0,$

7. *For what values of and* **do the equations**

(141)$x+2y+3z=6, x+3y+5z=9, 2x+5y+\lambda z=\mu$, (142)$x+y+z=6, x+2y+3z=10, x+2y+\lambda z=\mu$
(143)$x+2y+z=6,\ x+4y+3z=10,\ x+4y+\lambda z=\mu$

(144)2x+3y+5z=,7x+3y-2z=8,2x+3y+ λ z= μ ,(145)x+y+z=6,x+2y+5z=10,2x+y+4z= μ ,
(146)-2x+y+z= λ ,x-2y+z= μ ,x+y-2z=@,(147)2x-3y-6z-5t=3,y-4z+t=1,4x-5y+8z-9t= λ

(148)x+ λ y+3z=0,4x+3y+ λ z=0,2x+y+2z=0,(149)3x-2y+z= λ ,5x-8y+9z=3,2x+y+ μ z=-1,

(150)x+y+4z=1,x+2y-2z=1, λ x+y+z=1,(151) λ x-y-z=0,-x+ λ y-z=0,-x-y+ λ z=0,
(152)(3 λ -8)x+3y+3z=0,3x+(3 λ -8)y+3z=0,3x+3y+(3 λ -8)z=0,
(153)x+y-z+t=2,2y+4z+2t=3,x+2y+z+2t= λ (154)2x-5y+2z=8,2x+4y+6z=5,x+2y+ λ z= μ ,
(156)x+y+z=1,2x+y+4z= λ ,4x+y+10z= λ^2,

have i)no solution(ii) a Unique solution (iii) an Infinite solutions

UNIT-II (DIFFERENIAL EQUATIONS)

FORMATION OF DEFFERENTIAL EQUATION

$(1) y = e^{x}\left(A\cos x + B\sin x\right), (2) y = 9e^{3x} + 6e^{5x}, (3) y = e^{-2x}\left(a\cos 2x + b\sin 2x\right)(4) y = cx - \frac{1}{c}, cx + c^{2}, (e) y = \frac{a+x}{x^{2}+1}, (f) y = 9x^{3} + 6x^{2},$

$(5) xy = Ae^{x} + Be^{-x} + x^{2}, (6) y = ae^{2x} + be^{-3x} + ce^{x} (7) e^{2y} + 2axe^{y} + a^{2} = 0$

(8) *Find the rifferentialequation of all circle touching the axis of , orat the origion and centres on the axis of* $-X$

Variables separable form

$(21)y-x\frac{dy}{dx}=a\left(y^2+\frac{dy}{dx}\right),(22)3e^x\tan y\ dx+\left(1+e^x\right)\sec^2 y\ dy=0,\ y(0)=\frac{\pi}{4}(23)(x+y)(dx-dy)=dx+dy,(24)xy\frac{dy}{dx}=1+x+y+xy,$

$(25)\frac{dy}{dx}+\sqrt{\frac{1-y^2}{1-x^2}}=0,(26)e^y\left(1+x^2\right)\frac{dy}{dx}=2x\left(1+e^y\right)=0,(27)\cos\theta\,dr-r\sin\theta\,d\theta=0,(28)\left(x^2-yx^2\right)\frac{dy}{dx}+\left(y^2+x^2y^2\right)=0$

$(29)\frac{dy}{dx}=xe^{y-x^2},(30)x\sqrt{1+y^2}\ dx+y\sqrt{1+x^2}\ dy=0,(31)\frac{dy}{dx}=e^{x-y}+x^2e^{-y}$

form of $\frac{dy}{dx}=f(ax+by+c)-(32)\frac{dy}{dx}=\cos(x+y)+\sin(x+y),(33)\frac{dy}{dx}=\frac{a^2}{(x-y)^2},(34)\frac{dy}{dx}=\sec(x+y),(35)\frac{dy}{dx}=(3x+y+4)^2,$

$(36)\frac{dy}{dx}=(4x+y+1)^2,(37)xy'=(y-x)^3,(38)y-\frac{dy}{dx}-x\tan(y-x)=1$

Homogeneous Equation

$(39)x\,dy-y\,dx=\sqrt{x^2+y^2}\ dx(40)\left[x\tan\frac{y}{x}-y\sec^2\frac{y}{x}\right]dx+x\sec^2\frac{y}{x}dy=0,(41)\left(1+e^{\frac{x}{y}}\right)dy+e^{\frac{x}{y}}\left[1-\frac{x}{y}\right]dy=0,(42)\frac{dy}{dx}=\frac{y^3+3x^2y}{x^3+3xy^2},$

$(43)\left(x^2+4y^2+xy\right)dx-x^2\,dy=0(44)x(x-y)\frac{dy}{dx}=y(x+y),(45)\left(x^2-y^2\right)dx=2xy\,dy,(46)\left(\sqrt{xy}-x\right)dy+y\,dx=0,(47)\left(x^3+y^3\right)dy-x^2y\,dx=0$

$(48)\left[x\cos\frac{y}{x}+y\sin\frac{y}{x}\right]y-\left[y\sin\frac{y}{x}-x\cos\frac{y}{x}\right]x\frac{dy}{dx}=0,(49)x\frac{dy}{dx}=y+x\cos^2\frac{y}{x},(50)\frac{dy}{dx}=\frac{y}{x}+\sin\frac{y}{x},(51)\frac{dy}{dx}=\frac{y}{x+ye^{-2\left(\frac{x}{y}\right)}}$

$(52)x\,dx+\sin^2\frac{y}{x}(y\,dx-x\,dy)=0,(53)ye^{\frac{x}{y}}dx=\left(xe^{\frac{x}{y}}+y^2\right)dy,(54)x\ dy\log\frac{x}{y}\ dx+\left[y^2-x^2\log\frac{x}{y}\right]dy=0$

Non-Homogeneous Equations

$(55)(x+y-1)\frac{dy}{dx}=x-y+2,(56)\frac{dy}{dx}=\frac{x+2y-3}{2x+y-3},(57)(3y-7x+7)dx+(7y-3x+3)dy=0,(58)(3y+2x+4)\ dx-(4x+6y+5)dy=0$

$(59)(2x+y+1)dx+(4x+2y-1)\ dy=0,(60)\frac{dy}{dx}+\frac{2x+3y+1}{3x+4y-1}=0,(61)(x+y)(dx-dy)=dx+dy$

LINEAR EQUATIONS

$(62) x\left(1-x^2\right)\frac{dy}{dx}+\left(2x^2-1\right)y = x,^3 (63) x^2\frac{dy}{dx} = e^y - x, (64) \cos^2 x\frac{dy}{dx}+y = \text{Tan}\, x, (65)\left(x^2+1\right)\frac{dy}{dx}+2xy = x^2, (66)\left(1+x^3\right)\frac{dy}{dx}+6x^2 = 1+x^2,$

$(67) x\log x\frac{dy}{dx}+y = 2\log x (68)\frac{dy}{dx}-y\,\text{Tan}\, x = 3e^{-\sin x} y(0)=4, (69)\left(1+y^2\right)+\left(x-e^{-\text{Tan}^{-1}} y\right)\frac{dy}{dx} = 0, (70)\ e^{-y}\sec^2 y\, dy = dx + x\, dy,$

$(71) \cot 3x\frac{dy}{dx}-3y = \cos 3x+\sin 3x (72) x^3\sec^2 y\frac{dy}{dx}+3x^2\,\text{Tan}\, y = \cos x, (73)\frac{dy}{dx}+(y-1)\cos x = e^{-\sin x}\cos^2 x, (74) xy\left(1+xy^2\right)\frac{dy}{dx} = 1,$

$(75)\left(1-x^2\right)\frac{dy}{dx}+xy = y^3\sin^{-1} x, (76)\frac{dy}{dx}+y\cot x = 4x\ \csc x\ , y\left(\frac{\pi}{2}\right) = 0, (77)\frac{dy}{dx}+y\ \cot x = 5e^{\cos x}, (78)\sqrt{1-y^2}\ \ dx = \left(\sin^{-1} y - x\right) dy$

Bernouli's Equation

$(79)\frac{dy}{dx}+\frac{x}{1-x^2}y = x\sqrt{y}, (80)\frac{dy}{dx}+x\sin 2y = x^3\cos^2 y, (81)\left(1-x^2\right)\frac{dy}{dx}+xy = y^3\sin^{-1} x, (82) 3y' - y\cos x = y^4(\sin 2x - \cos x)$

$(83) x\frac{dy}{dx}+y = x^3y^6, (84) x^3\sec^2 y\frac{dy}{dx}+3x^2\,\text{Tan}\, y = \cos x, (85)\frac{dy}{dx}-\frac{\text{Tan}\, y}{1+x} = (1+x)e^x\sec y, (86)\left(xy^2 - e^{\frac{1}{x^3}}\right)dx - x^2y\ dy = 0,$

$(87)\frac{dy}{dx}+\frac{y\log y}{x} = \frac{y(\log y)^2}{x^2} (88) y - \cos x\frac{dy}{dx} = y^2(1-\sin x)\ \cos x\ y(0) = 2, (89)\,\text{Tan}\, y\frac{dy}{dx}+\tan x = \cos y\ \cos^2 y$

$(90)\sec^2 y\frac{dy}{dx}+2x\,\text{Tan}\, x = x^3, (91)\ 2y\cos^2 y\frac{dy}{dx}-\frac{2}{x+1}\sin^2 y = (x+4)^3, (92)\frac{dy}{dx} = e^{x-y}\left(e^x - e^y\right), (93)\frac{dy}{dx} = (\sin x - \sin y)\frac{\cos x}{\cos y}$

$(94)\frac{dy}{dx}-\frac{\text{Tan}\, y}{1+x} = (1+x)e^x\sec y, (95)\, y\, sun2x\ dx - \left(1+y^2+\cos^2 x\right)dy = 0, (96)\frac{dy}{dx} = 1 - x(y-x) - x^3(y-x)^3$

Exact differential Equation

$(100)(hx+by+f)dy+(ax+hy-g)dx = 0, (102)\left(e^y+1\right)\cos x\, dx + e^y\sin x\, dy = 0, (103)\left(xe^{xy}+2y\right)\frac{dy}{dx}+ye^{xy} = 0, (104)\frac{dy}{dx}+\frac{5x-17y+9}{3y-17x+15} = 0$

$(105)(r+\sin\theta-\cos\theta)dr + r(\sin\theta+\cos\theta)d\theta = 0, (106)\frac{dy}{dx}+\frac{y\cos x+\sin y+y}{\sin x+x\cos y+x} = 0, (107)(2y\sin x+\cos y)dx = [x\sin y+2\cos x+\text{Tan}\, y]dy = 0,$

$(108) x\, dx + y\, dy = \frac{a^2(x\, dy - y\, dx)}{x^2+y^2}, (109)\left(x^2-4xy-2y^2\right)dx+\left(y^2-4xy-2y^2\right)dy = 0, (110) y\left(x+\frac{1}{x}\right)\cos y\, dx + [x+\log x - x\sin y]dy = 0$

$(112)\left[\sec x\,\text{Tan}\, x\,\text{Tan}\, y - e^x\right]dx + \sec x\sec^2 y\, dy = 0, (113)[\cos x\,\text{Tan}\, y+\cos(x+y)]dx + \left[\sin x\sec^2 y+\cos(x+y)\right]dy = 0,$

$(114)\frac{2x}{y^3}dx+\frac{y^2-3x^2}{y^4}dy = 0, (115)(2xy+y-\text{Tan}\, y)dx+\left[x^2 - x\,\text{Tan}^2 y+\sec^2 y\right]dy = 0$

Non –Exact Homogenous Equations

$(121)\left(x^2y-2xy^2\right)dx-\left(x^3-3x^2y\right)dy=0,(122)\left(x^2+y^2\right)dx=2xy\,dy,(123)\left(xy\ e^{\frac{x}{y}}+y^2\right)dx-x^2e^{\frac{x}{y}}dy=0,(124)(1+xy)x\,dy+(1-yx)x\,dx=0$

$(125)r\left(\theta^2+r^2\right)d\theta-\theta\left(\theta^2+2r^2\right)dr=0,(126)\left(3xy^2-y^3\right)dx-\left(2x^2y-xy^2\right)dy=0,(127)y-x\frac{dy}{dx}=x+y\frac{dy}{dx},$

$(128)\left(x^2y-2xy^2\right)dx-\left(x^3-3x^2y\right)dy=0$

$y\ f(xy)dx+x\ g(xy)dy=0\ form$

$(129)y\left(x^2y^2+2\right)dx+x\left(2-2x^2y^2\right)dy=0,(130)(xy\sin xy+os\,xy)y\,dx+(xy\sin xy-\cos xy)x\,dy=0,(131)y(1+xy)dx+x(1-xy)dy=0$

$(132)y\left[xy+2x^2y^2\right]dx+x\left[xy-x^2y^2\right]dy=0,(134)\left(x^2y^2+xy+1\right)y\,dx+\left(x^2y^2-xy+1\right)x\,dy=0$

$\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}=N\ f(x)$

$(135)2xy\,dy-\left(x^2+y^2+1\right)dx=0,(136)(zxy+1)y\,dx+\left(1+2xy-x^3y^3\right)dy=0,(137)\left(3xy-2ay^2\right)dx+\left(x^2-2axy\right)dy=0$

$(138)\left(x^2+y^2+2x\right)dx+2ydy=0,(139)\left(x^3-2y^2\right)dx+2xydy=0,(140)\left(x^2+y^2+x\right)dx+xydy=0,(141)\left(x^2+y^2\right)dx-2xy\,dy=0$

$(142)\left(y+\frac{y^3}{3}+\frac{x^2}{2}\right)dx+\frac{1}{4}\left(x+xy^2\right)dy=0,(143)\left(-y+y^2\right)dx+xy\,dy=0,(144)\left(xy^2-x^2\right)dx+\left(3x^2y^2+x^2y-2x^3+y^2\right)dy=0$

$\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}=M\ g(y)$

$(145)\left(xy^3+y\right)dx+2\left(x^2y^2+x+y^4\right)dy=0,(146)\left(y^4+2y\right)dx+\left(xy^3+2y^4-4x\right)dy=0,(147)y\left(2xy+e^x\right)dx-e^xdy=0$

$(148)y(x+y+1)dx+x(x+3y+2)dy=0,(149)\left(3x^2y^4+2xy\right)dx+\left(2x^3y^3-x^2\right)dy=0$

Find the Orthogonal trajectories

$(151)ay^2=x^3,(152)xy=c^2,(153)x^2-y^2=c^2,(154)x^2+2gx+y^2+c=0,(156)x^2+\left(y-c\right)^2=c^2,(157)e^x+e^{-y}=e,(158)r=a\left(1-\cos\theta\right)()r^n\sin n\theta=a^n$

$(159)r^n=a^n\cos n\theta,(160)r=\frac{2a}{1+\cos\theta},(161)r=2a\left(\cos\theta+\sin\theta\right),(162)r=ce^{\theta},(163)r^n\sin n\theta=a^n\quad(164)r=c\left(\sec\theta+\text{Tan}\,\theta\right),(165)r^2=a^2\cos 2\theta$

$(166)x^{n3}+y^{n3}=9^{n3}(hypocycloids),(167)y=a\,x^n,(168)y=\frac{x^3-a^3}{3x},(169)4ay=x^2,(170)\frac{x^2}{a^2}+\frac{y^2}{a^2+\lambda}=1,\ \lambda\ parameter,(171)r=\frac{2a}{1+\cos\theta},$

(172) *Find the equation of the family of all orthogonal trajectories of the family of circles which pass through the points* $(2,0)(-2,0)$

Self Orthogonal

$(173)y^2=4a\left(x+a\right),(174)\frac{x^2}{a^2+\lambda}+\frac{y^2}{b^2+\lambda}=1,(175)\frac{x^2}{c}+\frac{y^2}{c+2}+1=0,$

Find General solution and singular of Clairat's equations

$(186)(y-px)(p-1)=p,(187)e^{4x}(p-1)+e^{2y}p^2=0,(188)y=(x-a)p-p^2,(189)y=xy'-(y')^3,(190)y=xy'+(y')^2,(191)p=\sin(y-xp),(192)y=xp+\frac{a}{p},$

$(193)y=px+\sqrt{a^2p^2+b^2}(194)(y+px)^2=x^2p,(195)x^2(y-px)=yp^2,(196)p^2(x^2-1)-2pxy+y^2-1=0,(197)e^{3x}(p-1)+p^3e^{2y}=0,(199)y=y=xp+\frac{a}{p},$

$(200)y=(x-a)\ p-p^2,\ (200)xp+p^2=y.(201)y=xp+e^p y=px+\sqrt{1+p^2}$

RiceAtis equation

$(206)\ y'=y^2-(2x-1)y+x^2, y=1,(207)\ y'=2xy^2+(1-4x)y+2x-1, y=x,(208)\ y'=3y^2-(1+6x)y+3x^2+x+1, y=x$

$(209)\ y'=4xy^2+(1-8x)y+4x-1, y=1$

Solve the Differential Equations

$(231)\left(1+e^{\frac{x}{y}}\right)x\,dx+y\,dy=\frac{a^2(x\,dy-y\,dx)}{x^2+y^2},(232)\,dx+e^{\frac{x}{y}}\left(1-\frac{x}{y}\right)dy=0,(233)(ydx+xdy)x\ \cos\frac{y}{x}=(xdy-ydx)\,y\sin\frac{y}{x},(234)\frac{dy}{dx}=\frac{y}{x}+\tan\left(\frac{y}{x}\right)$

$(235)\,y\sin 2x\,dx-(y^2+\cos^2 x)\,dy=0,(236)\left(x^2-ay\right)dx=(ax-y^2)\,dy,(237)\,x\,dy-y\,dx=xy^2dx,(238)(1+xy)x\,dy+(1-xy)y\,dx=0,$

$(239)(ydx-xdy)+\log x\,dx=0,(240)\,x\,dy-y\,dx=x\cos^2\left(\frac{y}{x}\right)dx,(241)\,x^2y\ dx-(x^3+y^3)\,dy=0,(242)\,xy\,dx-(x^2+2y^2)dy=0,$

$(243)\left(3xy^2-y^3\right)dx-(2x^2y-xy^3)dy=0(244)\,y(x^2y^2+2)\,dx+x(2-2x^2y^2)dy=0,(245)\left(x^3y^3+x^2y^2+xy+1\right)y\,dx-\left(x^3y^3-x^2y^2-xy-1\right)x\,dy=0$

$(246)\,2xy\ dy-(x^2+y^2+1)\ dx=0,(247)\left(xy^2-e^{\frac{1}{x^3}}\right)dx-x^2y\ \ dy=0,(248)\left(x^3-2y^2\right)dx+2xy\ dy=0,(249)\left(xy^3+y\right)dx+2(x^2y^2+x+y^4)dy=0,$

$(250)\left(1-x^2\right)y+2x\,y=x\sqrt{1-x^2}\ (251)\left(1+y^2\right)x'=\tan^{-1}y-x\ (x'=\frac{dx}{dy}),(252)\frac{dy}{dx}+y\cot x=2\cos x,(253)\frac{dy}{dx}-y\ \tan x=-2\sin x,(x+y+1)\ \frac{dy}{dx}=1$

$(254)\left(x+2y^3\right)\frac{dy}{dx}=y,(255)\frac{dy}{dx}+\frac{y}{x}=y^2x,(256)\frac{dy}{dx}+\frac{xy}{1-x^2}=x\,y^{\frac{1}{2}},(257)\,x\ \frac{dy}{dx}+y=y^2x^3\ \cos x,(258)\frac{dy}{dx}=e^{x-y}\left(e^x-e^y\right),(259)\frac{dy}{dx}=x^3y^3-xy$

UNIT-III(HIGHER ORDER LINEAR D.E)

Solve the Differential Equation:

$(1)\frac{d^3y}{dx^3}-9\frac{d^2y}{dx^2}+23\frac{dy}{dx}-15y=0,(2)\frac{d^3x}{dt^3}-2\frac{d^2x}{dt^2}-3\frac{dx}{dt}=0,(3)\frac{d^4y}{dx^4}+13\frac{d^2y}{dx^2}+36y=0,(4)\frac{d^4x}{dt^4}+4x=0,(5)y''-2y'+3y=0,y(0)=1,y'(0)=0,$

$(6)y'''-5y''+7y'-3y=0,y(0)=1,y'(0)=0,y''(0)=-5,(7)\left(D^2-2D+5\right)^2y=0,(8)y^{iv}+32y''+256y=0,(9)\left(D^3+1\right)^3\left(D^2+D+1\right)^2y=0,$

$(10)\frac{d^2y}{dt^2}+4\frac{dy}{dt}+29y=0, when\, x=0, y=0\, and\, \frac{dy}{dx}=15,(11)\left(D^3-6D+11D-6\right)y=e^{-2x}+e^{-3x},(12)(D-2)^2y=8\left(e^{2x}+\sin 2x+x^2\right),$

$(13)(D+2)(D-1)^2y=e^{-2x}+2\sin hx(14)\frac{d^4y}{dx^4}-y=\cos x\cosh x,(15)\frac{d^2y}{dx^2}-2\frac{dy}{dx}+y=xe^x\sin x,(16)\left(D^2+1\right)y=x^2e^{3x},(17)\left(D^3+1\right)y=3+5e^x,$

$(18)\left(D^2+4\right)y=e^x+\sin 2x+\cos 2x,(19)y''+4y'+4y=4cox+3\sin x\;\;,y(0)=1,y'(0)=0,(20)y''+4y'+20y=23\sin 3t-15\cos t\, y(0)=0,y'(0)=-1,$

$(21)\left(D^2+4\right)y=\sin t+\frac{1}{3}\sin 3t+\frac{1}{5}\sin 5t,\; y(0)=1,y'(0)=\frac{3}{35},(22)D^2\left(D^2+4\right)=320\left(x^3+2x^2\right),(23)\left(D^3-D^2-6D\right)y=1+x^2,(24)y'''+2y''-y'-2y=1-4x^3$

$(25)\left(D^2-7D+6\right)y=e^{2x}(1+x),(26)\left(D^4+1\right)y=e^x\cos x,(27)\left(D^2-3D+2\right)y=xe^{3x}+\sin 2x+x^2e^{-3x},(28)\left(D^2+9\right)y=8x^2\;e^{2x}\sin 2x$

$(29)\left(D^2-4D+4\right)y=x^2\sin x+e^{2x}+3,(30)y''+4y'+20y=23\sin t-15\cos t\;\; y(0)=0,y'(0)=-1,(31)\left(D^3+1\right)y=\cos(2x-1),(32)\left(D^2+1\right)y=x,$

$(33)\left(D^2+4\right)y=\mathrm{Tan}\,2x,(34)\frac{d^2y}{dx^2}-y=\frac{2}{1+e^x},(35)y''+6y'+9y=\frac{e^{-3x}}{x},(36)y''-2y'+y=e^x\log x,(37)y''+y=\operatorname{cosec} x$

VARIATION OF PARAMETERES METHOD

$(51)\left(D^2+1\right)y=x,(52)\left(D^2+4\right)y=\text{Tan}\,2x,(53)\frac{d^2y}{dx^2}-y=\frac{2}{1+e^x},(54)\,y''+6y'+9y=\frac{e^{-3x}}{x},(56)\,y''-2y'+y=e^x\log x,(57)\,y''+y=\cos ec\,x$

$(58)\,y''-2xy'+2y=e^x\,\text{Tan}\,x,(59)\,y''+4y'+4y=e^{-2x}\sin x,(60)\,y'''-6y''+11y'-6y=e^{-x},(61)\,y'''-14y'=\sec 2x,(62)\,y'''-6y''+12y'-8y=\frac{e^{2x}}{x}$

Method of Reduction of Order

$(71)\,x^2y''+4xy'+2y=0,\ y_1(x)=\frac{1}{x},(72)\,y''-y'+6y=0\ \ y_1=e^{3x},(73)\left(x^2-1\right)y''-2xy'+2y=0,y_1=x,,(74)\,x^2y''+xy'+\left(x^2-\frac{1}{4}\right)y=0,y_1=x^{\frac{-1}{2}}\sin x$

$(75)(x-2)\,y''-xy'+2y=0,x\neq 2,y_1=e^x$

Using the method of variation of parameters and for given L.I solution then find P.I & G.S

$(76)\,x^2y''+xy'-y=x^3,y_1=x,y_2=\frac{1}{x},(77)\,x^2y''+xy'-4y=x^2\log x,y_1=x^2,y_2=\frac{1}{x^2},(78)\,x^2y''-xy'+y=\frac{1}{x^4},y_1(x)=x,\ y_2=x\log x$

$(79)\,y''+4y'+8y=16e^{-2x}\cos ec^2\,2x,\ y_1=e^{-2x}\cos 2x,y_2=e^{-2x\sin 2x}$

Euler-Cauchy's Equations and Legendre's Linear Equation

$(81)\, x^3\frac{d^3y}{dx^3}+2x^2\frac{d^2y}{dx^2}+2y=10\left(x+\frac{1}{x}\right), (82)\, x^2\frac{d^2y}{dx^2}-x\frac{dy}{dx}-3y=x^2\log x, (83)\, x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+y=\log x\sin(\log x) (84)\, x^2\frac{d^2y}{dx^2}-2x\frac{dy}{dx}-4y=x^4,$

$(85)\, \frac{d^2y}{dx^2}+\frac{1}{x}\frac{dy}{dx}=\frac{12\log x}{x^2}, (86)\, x^2\frac{d^3y}{dx^3}-4x\frac{d^2y}{dx^2}+6\frac{dy}{dx}=4, (87)\, x^2\frac{d^2y}{dx^2}-2x\frac{dy}{dx}-4y=x^2+2\log x, (88)\, x^3\frac{d^3y}{dx^3}+3x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+8y=65\cos(\log x),$

$(89)\, x^2\frac{d^2y}{dx^2}-3x\frac{dy}{dx}+y=\frac{\log x\sin(\log x)}{x}+1, (90)\left(x^2D^2+3xD+1\right)y=\frac{1}{(1-x)^2}, (91)\left(D^2+\frac{1}{x}D\right)y=\frac{12\log x}{x^2}, (92)\left(x^2D^2+4xD+6\right)y=(\log x)^2,$

$(93)(3x+2)^2\frac{d^2y}{dx^2}+3(3x+2)\frac{dy}{dx}-36y=3x^2+4x+1, (94)(2x+3)^2\frac{d^2y}{dx^2}-2(2x+3)\frac{dy}{dx}-12y=6x, (95)(1+2x)^2\frac{d^2y}{dx^2}-6(1+2x)\frac{dy}{dx}+16y=8(1+2x)^2,$

$(96)\left((1+x)^2D^2+(1+x)D+1\right)y=\cos\left[\log(1+x)\right], (97)\left((1+x)^2D^2+(x+1)D\right)y=(2x+3)(2x+4), (98)\left((2x-1)^3D^3+(2x-1)D-2\right)y=x$

Simultaneous Linear Differential Equation with Constant Co-efficients

$(121)\frac{dx}{dt}+4x+3y=t, \frac{dy}{dt}+2x+5y=e^t, (122)\frac{d^2x}{dt^2}+4x+5y=t^2, \frac{d^2y}{dt^2}+5x+4y=t+1, (123)\, t\frac{dx}{dt}+y=0, x(1)=1\, and\ t\frac{dy}{dt}+x=0, y(-1)=0,$

$(124)\frac{dx}{dt}=7x-y, \frac{dy}{dt}=2x+5y, (125)\frac{d^2x}{dt^2}-\frac{dy}{dt}=2x+2t, \frac{dx}{dt}+4\frac{dy}{dt}=3y, (126)\frac{d^2x}{dt^2}+y=\sin t, \frac{d^2y}{dt^2}+x=\cos t,$

$(127)(2D-4)y_1+(3D+5)y_2=3t+2, (D-2)y_1+(D+1)y_2=t, (128)(2D+3)y_1+(D+5)y_2=t^2, (8D+14)y_1+(11D+28)y_2=c^{2t}$

$(129)(D+3)y_1+(3D+23)y_2=e^{-2t}, (D+2)y_1+(4D+14)y_2=e^{2t}, (130)$

UNIT-IV(POWER SERIES SOLUTIONS AND GAMMA,BETA FUNCTIONS)

1. Classify the singular points of Differential Equations are given below

$(1)\left(1-x^2\right)y''-2xy'+n(n+1)y=0.(2)\left(1-x^2\right)y''-2xy'+2y=0,(3)x^2y''+\left(x+x^2\right)y'-y=0,$

$(4)x^2y''+xy'+\left(x^2-n^2\right)y=0,(4)x^2y''+axy'+6y=0,(5)x^3(x-2)y''+x^3y'+6y=0,(6)x^2y''+\sin xy'+\cos xy=0,$

$(7)x^4y''+4x^3y'+y=0,(8)x^3\left(x^2-1\right)y''-x(x+1)y'-(x-1)y=0,(9)x^2y''+4y'+\left(x^2+2\right)y=0,$

$(10)\left(x^2+x-2\right)^2y''+3(x+2)y'+(x-1)y=0,(11)2x^2y''+7x(x+1)y'-3y=0,(12)\left(4+x^2\right)y''-6xy'+8y=0,$

$(13)2x^2y''+\left(2x^2-x\right)dy'+y=0,(14)x(x+1)y'-(2x+1)y=0,(15)2x^2y''+xy'-\left(x^2+1\right)y=0,$

$(16)9x(1-x)y''-12y'+4y=0,(17)\left(x-x^2\right)y''+(1-5x)y'-4y=0,(18)2x(1-x)y''+(5-7x)y'-3y=0$

2. Find the series solution about the point $x=0$ **, of the following Differential Equation.**

$(21)y'+3y,y'-4y=0,(22)(1-x^2)y'=2xy,(23)(x-1)y'=xy,(24)y'=xy,(25)(1+x)y'+xy=0,(26)y''+xy'-y=0,(27)y''+4y=0,y(2)=2,y'(2)=2$

$(28)x(x+1)y'-(2x+1)y=0,(29)xy'-(x+2)y=0,(30)y''-y=0,(31)y''+4y=0,(32)\left(1-x^2\right)y''-2xy'+2y=0,(33)y''-xy=0,y(1)=2,y'(1)=0$

$(34)\left(2+x^2\right)y''-2xy'+3y=0,\ y(1)=1,y'(1)=-1,(35)(1+2x)y''-y'+y=0,\ y(0)=0,y'(0)=1,(36)(1-x)y''+xy'+2y=0\ \ y(0)=2,\ y'(0)=1,$

$(37)\left(2-x^2\right)y''+2xy'-2y=0,(38)\left(4+x^2\right)y''-6xy'+8y=0,(39)y''+(x-1)^2y'-4(x-1)y=0,(40)y''+2xy'+y=0,(41)(1-x^2)y''-2xy'+6y=0,$

$(42)\left(1+x^2\right)y''-9y=0,(43)\left(1-x^2\right)y''+2xy'+y=0,\ y(0)=1,\ y'(0)=1,(44)\left(4+x^2\right)y''-6xy'+8y=0,(45)x(x+1)y''-(2x+1)y=0,$

$(46)\left(1+x^2\right)y''-9y=0,(47)y''+t^2y'-4ty=0,\ (48)\left(x^2+2\right)y''+xy'-(1+xy)=0,(49)y''-2x^2y'+4xy=x^2+2x+4,$

3. Find the series solution about the indicated point $x=x_0$ **of the following Differential Equation.**

(51) $y'=2y,\ x_0=1$ **,(52)** $y''-y=0,\ x_0=1$ **,(53)** $y''+xy'+y=0,x_0=2$ **,(54)** $(x+1)y'-(x+2)y=0\ x_0=-2$

$(55)xy'-y=0,\ x_0=1$ $(56)y''+(x-1)y'+y=0$ **, at** $x_0=2$ **.(57)** $(1+2x)y''+xy'+y=0$ **, at** $x_0=1$**,** $y(1)=1$**,** $y'(1)=-1$

$(58)y''+xy'-y=0,x_0=1$ **.** $(59)(1+x)y''-xy'-y=0$ **,at** $x_0=2$**,** $y(2)=1$**,** $y'(2)=0$

4. Find the series solution about the $x=0$ **point of the following Differential Equation by Frobenius method.**

(61) $2x^2y''+xy'-(x^2+1)=y=0$ **, (62)** $xy''+y'-xy$ **,(63)** $x(1+x)y''+3xy'+y=0$ **,(64)**

$x^2y''+6xy'+(6+x^2)y=0$ **(65)** $\left(1-x^2\right)y''-2xy'+6y=0$ **,(67)** $2x^2y''+(2x^2-x)y'+y=0$ **,(68)**

$x^2y''+xy'+\left(x^2-4\right)y=0$ **(69)** $x(1+x)y''+3xy'+y=0$ **(70)** $2x(1+x)y''+(1+x)y'-3y=0$ **,(71`)**

$4x^2y''-8xy'+5y=0$ **,(72)** $xy''+(1-2x)y'+x(x-1)y=0$ **,(73)** $\left(x+x^2\right)y''+\left(1+x\right)y'-y=0$ **,(74)** $x^2y''+xy'+(x^2-n^2)y=0$ **,(75)** $9x(1+x)y''-6y'+2y=0$

(76) $2x(1-x)y''+(1-x)y'+3y=0$ **,(77)** $3x(1-x)y''+2(1-x)y'+4y=0$ **,(78)** $2x^2(1+x^2)y''-3x(1+x^2)y'+2y=0$ **(79)** $xy''+(1-2x)y'+(x-1)y=0$ **,(80)** $4(x^2+x^4)y''+16x^3y'+y=0$ **,(81)** $2x^2y''+xy'-3y=0$ **,(82)** $16x^2y''+3y=0$

(83) $x^2y''+4xy'+(x^2+2)y=0$ **,(84)** $x^2y''+xy'+(x^2-1)y=0$ **,(85)** $x^2y''+6xy'+(6-4x^2)y=0$

(86)$9x(1-x)y''-12y'+4y=0$ **,(87)** $2x^2y''+xy'-(x+1)y=0$ **,(88)** $2x(1-x)y''+(1-x)y'+3y=0$

(89) $2x^2\dfrac{d^2y}{dx^2}-x\dfrac{dy}{dx}+(1-x^2)y=x^2$ **,(90)** $2x(1-x)y''+(5-7x)y'-3y=0$ **,(91)** $2x^2y''+(2x^2-x)y'+y=0$ **,**

(91) $x(x-1)y''+(3x-1)y'+y=0$ **, (92)** $\left(x-x^2\right)y''+(1-5x)y'-4y=0$ **,(93)** $xy''+(1+x)y'+2y=0$ **,**

(94) $x^2y''-x(1+x)y'+y=0$ **, (95)** $x^2y''+xy'+(x^2-y)\ y=0$ **,(96)** $x(1-x)\dfrac{d^2y}{dx^2}-(1+3x)\ y'-y=0$

5. Find the series solution about the indicated point $x=x_0$ of the following Differential Equation by Frobenius method.,

(101) $2(1-x)y''-xy'+y=0, x=1$ **,(102)** $9x(1+x)y''-6y'+2y=0,\ x=-1$ **,** (103) $x(x-2)y''+4y'+3y=0,\ x=2$

(104)$y''+(x-1)y'+y=0\ x_0=2$