## Assignment No. 1

## Unit I: Linear Differencial Equations

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 $(0^2-30+2)y = 1 + \cos e^{-x}$ 

we see en many times, so, put

Oifferenciating,  $-e^{-x} dx = dt \Rightarrow -t dx = dt$ 

NOW.

 $p^{2}-2p-p+2=0 \Rightarrow p(p-2)-1(p-2)=0$ : p=1,2-Real and distinct roots.

: 4p1 = 1 ex 5 = x = e x

Put e = t ... (from ())

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y_{p3} = 1 e^{2} \int t \cdot e^{-t} \cdot dt = 1 e^{2} \int -e^{-t} \cdot dt
= 1 e^{2} (+1) e^{-t} = 1 e^{2} \cdot e^{-e^{-t}}
= (D-2) \qquad (D-2)
       Again using 3),
yp_1 = e^{2\alpha} \int e^{-2\alpha} e^{\alpha} e^{-e^{-\alpha}} d\alpha
= e^{2\alpha} \int e^{-\alpha} e^{-e^{-\alpha}} d\alpha
    Put e^{-\chi} = t, : dn = dt/-t...[from D]

: yp_1 = e^{2\chi} \int t \cdot e^{t} dt = e^{2\chi} \int -e^{-t} dt = e^{2\chi} \int e^{-t} dt
         : yp1 = e24. e-1
       y_{c} = c_{1} \cos e^{x} + c_{2} e^{2x} - c_{2}
f_{ct}, y_{1} = e^{x}, y_{2} = e^{2x}.
\therefore \omega = |y_{1}| y_{2}| \cdots (\omega_{1} \cos k_{1} \sin k_{2}) \therefore f(x) = \omega_{2} e^{-x}
= |e^{x}| e^{2x}| = 2e^{3x} - \frac{3x}{2} = e^{3x}.
\therefore \omega = e^{2x}
\therefore \omega = e^{2x}
  Now, yp2= 1 \cos e^{-2}.
       u = J - y2. f(x) dx.
                        \frac{1-e^{2\alpha}\cos^{-\alpha}d\alpha}{e^{3\alpha}}=\int_{-e^{-\alpha}}^{-e^{-\alpha}\cos^{-\alpha}d\alpha}.
         Put e^{x} = t \Rightarrow dx = \frac{dt}{-t}

\therefore u = \int -t \cot dt = \int \cot dt = \sin e^{-x}
```

Now, 
$$V = \int y_1 \cdot f(x) dx$$

$$= \int e^{2x} \cdot \cos^{-x} dx = \int e^{2x} \cdot \cos^{-x} dx$$

Put  $e^{-x} = t \Rightarrow dx = \frac{dt}{-t}$ 

$$\therefore V = \int t^2 \cdot \cot t dt = -\int t \cot t dt$$

$$= -\left[t \sin t - \int 1 \cdot \sin t dt\right] = -\left[t \sin t - (-\infty t)\right]$$

$$\therefore V = -t \sin t - \cos t = -e^{-x} \sin e^{-x} - \cos e^{-x}$$

Now,  $y_1 = u \cdot y_1 + v \cdot y_2$ 

$$= \left[\sin e^{-x}\right] e^{-x} + \left[-e^{-x} \sin e^{-x} - \cos e^{-x}\right] \cdot e^{2x}$$

$$= e^{x} \sin e^{-x} - e^{x} \sin e^{-x} - e^{2x} \cos e^{-x}$$

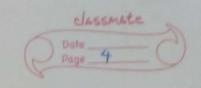
$$\therefore y = y_1 + y_2$$

$$\therefore$$

( $p^2 + i$ ) y = tand. AE:  $p^2 + i = 0$  $p = \pm i \rightarrow complex roots$ :  $p = \pm i \rightarrow complex roots$ :  $p = \pm i \rightarrow complex roots$ :

Now,  $yp = 1 \times = 1 + \tan \alpha$ .

Let, y, = osa, y2 = sina.



1. (1) = 1 U= J-ye. fra)dr = J-sinx. tanx dr.

 $-\int \sin^2 x \, dx = -\int \left(1 - \cos x\right) dx$ 

cos a da - Secolda = sina + Incera + tom

. : u = gird - In (send + tand).

NOW, V = Jy. fox) dx = 1 cosx. tanadx = foxor sim dx

· V = - cosa

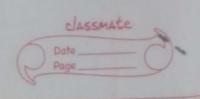
: 4p = U.y1 + V.y2

rniz[rea-1 + rea. [(xnot + mas) nl-kniz] = = rea. mis - (xnot + xnos) nl. real - rea. tonie =

". up = - cost. In (secol + tand)

: 4 = 4c + 4P

: 4 = C10000 + C25 ind - 0000. In (secol + tond)



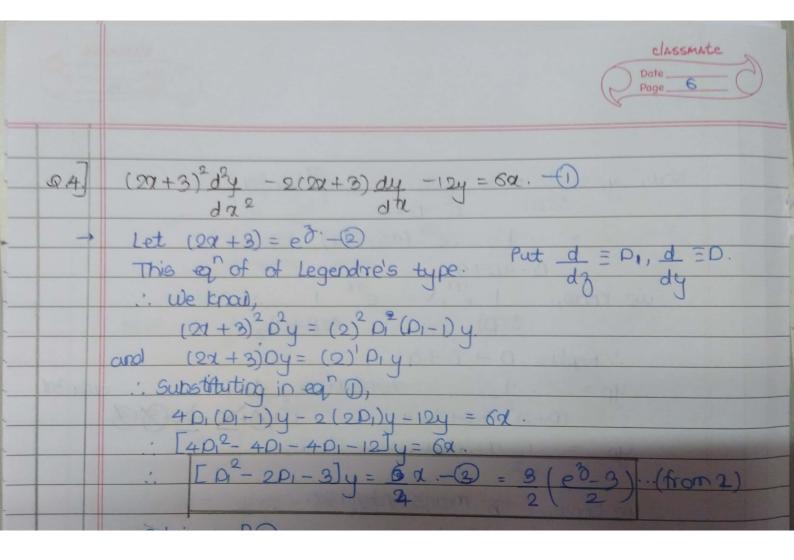
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\frac{d^{2}y}{dx^{2}} - 4dy + 4y = x \cdot e^{2x} \cdot \sin 3x \cdot \frac{d^{2}y}{dx} = \frac{2x}{\sin 3x} \cdot \frac{e^{2x}}{\sin 3x} \cdot \frac
                                       Now, y_p = 1 x = 1 x = 2^n \sin 3n.

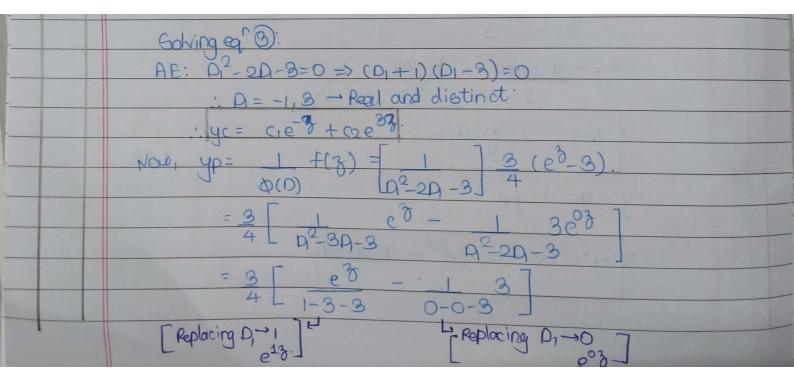
Now, y_p = 1 x = 1 x = 2^n \sin 3n.
                                                                                                                                                                                                                              D-40+4
                                                      we know , 1 ead , v = ead 1 . V (0+a)
                                                                                                         Replace 0 \to 0 + \alpha.

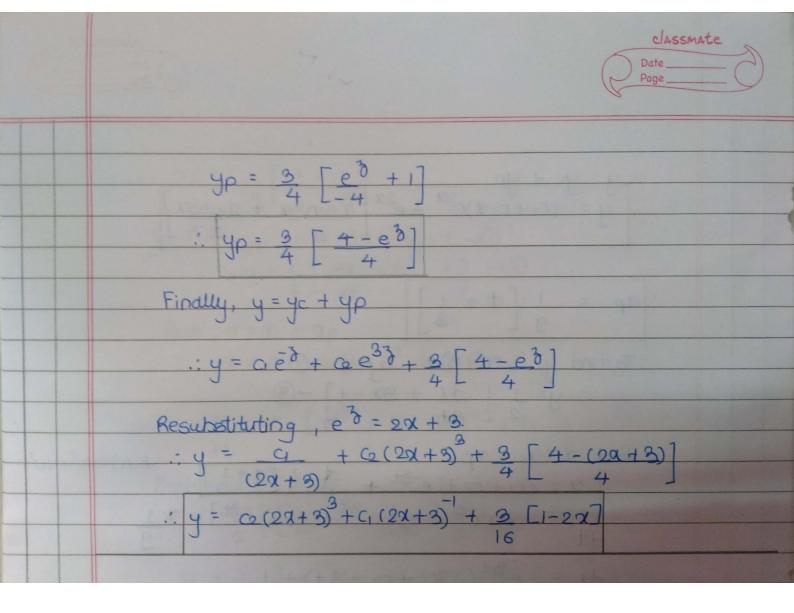
yp = e^{2\alpha}
(0+2)^2 - 4(0+2) + 4
yp = e^{2\alpha}
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           xsin 3x.
                                                                                                   we know to means to integrate:

yp=exi fx.sin3xdx
                                                                                                                                                                                         \frac{2x}{-81} \left[ - x \cos 3x + \int_{3}^{2} 1 \cos 3x + \sin 3x 
                                                                                                                                                                                                      = 27 [ - 7 053 x dx + 1 sin 300 dx
                                                                                                                                                                                                                                                                                                                 -1 [ 251032 - 11. 81032] + 151032
                                                                                                                                                                                      2 e<sup>2d</sup> [-1 [xsip3a + sip3a] +-0053x
                                                                              : yp = e29 - 26in32 - 200332
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$y = yc + yp$ $y = (c_1 + c_2x)e^{2x} - e^{2x} \left[ x \sin 3x + 2 \cos 3x \right]$ $y = (c_1 + c_2x)e^{2x} - e^{2x} \left[ x \sin 3x + 2 \cos 3x \right]$







95	$d\eta = dy = dz$
90	$\frac{dx}{dx} = \frac{dy}{dx} = \frac{dz}{2z}$
-	This is of type symmetrical simultaneous D.E.
	Solving by grouping:
	consider first and second nation
	da = dy - vorrable separable.
	22 - 4
	dx + dy = 0
	$\frac{dx + dy = 0}{2d}$
	Integrating,
	and + lny = c, > and + elny = g > lnow = ce.
	2
	: In $ay^2 = e^2$ i.e. $ay^2 = c_3 \to 0$
	Now, consider first and third ratio,
	$\frac{dq}{dx} = \frac{dz}{dx} \Rightarrow \frac{dx}{dx} = \frac{dz}{dx} \cdot \frac{(using 1)}{(using 2)}.$
	: dre + dz = 0 - varriable separable -
	$\frac{drl}{2} + \frac{dz}{2z - 4cs} = 0 - \frac{varriable separable}{2}$

$$\frac{1}{2} \frac{dx}{dx} + \frac{dx}{3} = 0$$

Integrating,

ina + in(3-203) = C4

 $\frac{2y^2 = (3 \text{ and } \alpha(3 - 2c3) = (5)}{i \cdot e}$   $\frac{2y^2 = c}{i \cdot 6} \text{ and } \alpha(3 - 2c) = (1)$ is the adultion.

Q6,  $\frac{dx}{dx} + 5x - 2y = t$ ,  $\frac{dy}{dx} + 2x + y = 0$ 

We will have to educe these D.E. Simultaneously. In operator form  $D = \frac{d}{dt}$ .

(0+5)x - 2y = t → 0 2x + (0+i)y = 0 - 12

To adve for a, eliminate y,

ie. (D+1). D + 2. D gives,

(0+1)(0+5)2-260+1)y = (0+1)t

+ 4x + 200+Dy = 0

[(0+)(0+5)+4]x = (0+1) t

i.e. (D+6D+9) = 1+t

Li This is LOE with constant coefficients in a and t.

AE = 02+60+9=0 = 0=-3,-3-1 Roal & repetitive.

NOW,

$$\frac{dp}{dp} = \frac{1}{2} \left( \frac{1+t}{2} \right) = \frac{1}{2} \left[ \frac{1+(p^2+60)}{2} \right] \left( \frac{1+t}{2} \right)$$

$$= \frac{1}{2} \left[ \frac{1-20}{3} + \cdots \right] \left( \frac{1+t}{2} \right)$$

$$= \frac{1}{2} \left[ \frac{1+t-2}{3} \right] = \frac{t}{27}$$

