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at MET Bhujbal Knowledege City

Engg Maths 3 Department

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	Page
	Laplace Transformation
	The late to respect the beautiful of the first the beautiful of the first th
	Paris layon la
- 1	Basic formulae
1)	$(a+b)^2 = a^2 + 2ab + b^2$
2)	$(a-b)^2 = a^2 - 2ab + b^2$
31	
_4	$a^2 + b^2 = (a + ib)(a - ib)$
	$eq.(D^2+4)=(D+2i)(D-2i)$
	1507 = 1 = 5(1) 1 2 (-1)
	$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$
_5/	$(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$
_6>	$\frac{(a-b)^2-a^2-3ab+3ab}{2a^2-3ab+3ab}$
	$eq \cdot (t-3)^3 = t^3 - 9t^2 + t71 - 27$
	And Last Your Start But I
	Tuinnettu
7/15	Trignomotry
811	
12	Sin20 + cces20 = 1
	1 tan C - Sec C
	$12 - \frac{1}{2}$
3>	$\frac{1}{2}$
43	111
	1 (n (A - B) - SUCH - SEE
_65,	The Acas - Sun H. Sall
62	COS CITAL CON B + SINA. SIND
7)	$(os(A-B) = (osH \cdot Cost)$
	1 1 1 2 0 - 2 cas 0
87	20-2 /10-2
9>	Sin 30 = 35410
Matter	30 = (03 30 1 30
	(as 30 = 4 (as 0 - 3 (as a = 4 cas a = 4)
10>	(as 30 = 4 (as a)
	1 / I
No. of Concession, Name of Street, or other party of the Concession, Name of Street, or other pa	50 x5 = 1 1 / 1 3 X
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	The Laplace treconsporm of the function of Lt) for tool denoted by L & F(t) } and is given by
Residence by Commission of the	- The Latriaco Locuisticam of the fanction for
	denoted by 2 & f (t) } and is given by
	D
	$L\xi F(t) z = \int e^{-st} F(t) dt$
	43 (6)
	Where 5 is Parameter
	Note: - Notation
	1 C C (1) 2 - r (C) - F(S)
	$\frac{1 \{ \{ (t) \} = \{ (s) = F(s) \}}{eg \cdot 1 \{ (t) \} = 1 = \overline{y} (s)}$
	$\frac{g}{g} \cdot \frac{1}{g} \cdot \frac{1}{g} \cdot \frac{1}{g} = \frac{1}{g} \cdot \frac{1}$
	At Standard formulare of Laplace transform (LT)
	To the state of th
	1 (1.2
	1 { K} = K is constant
-	
2>	$eg \cdot L \{1\} = 1$ $L \{\frac{3}{2}\} = \frac{3}{2}$
	5) 25 2
	1 15 / - 15
	S S
3	
	1 (172 - 1
- 2>	L 2 2 5 - 1. where (1) 0>0
-	95) - 1 x 2 x 2 x 2 x 4 x 2 x
	$\frac{1}{2}$
	1 (12 -1
10 m	$\frac{g \cdot L + f - 1}{G}$
1 10	-15757
	6
	3
877	25 (20) I p (10) 4 = 210 5 - 3 (0) 4 - 30 - 30
35	2 \$ £ 0 \ = . [1 + 1
	(n+1)
	where & TI+1 = gamma (A+1)
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	$\overline{\Omega}$ $\overline{\Omega} + 1 = \Omega$
	(I) Intl=n! if n is the integer
1/4/3	2 VIII
Tig	$e_0 \cdot L + \frac{3}{2} = \sqrt{3} + \frac{1}{2} = \frac{3}{2} = \frac{3}{2} = \frac{3}{2} = \frac{1}{2}$
	3 3 = 3 1 +1
	$5^{3/2+1}$ $5^{3/2}$ $5^{1/2}$
-	53/2+1 55/2 55/2
	=3 x1 [17 1 5 1 4 2 1 1 2 2 1
	2 2 2
	5/2
-	$= \frac{3}{2} \cdot \sqrt{\sqrt{1}} = \frac{3}{4} \sqrt{4}$
	22 5 4
	512
	$=3\sqrt{\pi}$
	4 65/2
	eg: $[5t^{7/2}] = 7.5.3.1$ [37] 2 2 2 2 2 2
	. 9/2
$-\parallel$	5 5 5 5 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7
9.	= 7·57·13 · 1 VT
	2 2 2 2
	15 9/2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
>	1 { Sin a t } = a processor property
	$\frac{1 \cdot \left\{ \sin a t \cdot \right\}}{s^2 + q^2}$
	PETINAL BELLEVIE - STATE FOR STATE PROTEST
7	eg: L & Sin 5 t ? = 5
	$25\sin 27 = 1$
-	5'+1
The state of the s	

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	->	$525e^{-6t}$ + 71 5 5 5 4 5 5 4 5 5 4 5 5 4 5 5 6 5 6 6 6 6 6 6 6 6 6 6
		$\frac{5}{5+6} + \frac{375}{5^2+4} + \frac{12}{5^2-16}$
	5>	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
		(53) (52) 5 18 - 12 + 4 5^3 5^2 5
6 <i>)</i>	> _ [$\begin{array}{cccccccccccccccccccccccccccccccccccc$
		$\frac{25}{5} + \frac{300}{5^2} + \frac{240}{5^3} + \frac{384}{5^4}$
		$\frac{\sin(4-6+)}{\sin(4-6+)}$ $\frac{\sin(4-6+)}{\sin(4-6+)}$
		$\sin 4 \left(\frac{5}{5^2 + 36} \right) - \cos 4 \left(\frac{6}{36} \right)$ = $5 \sin 4 - 6 \cos 4$
		52+36

	Classmate Date Page Date
8>	15 (as (7t-2}
→ ·	L \leq $\cos 7 + \cos 2 + \sin 7 + \sin 2$ \leq $\cos 2 / \leq (\cos 7 + 2) + \sin 2 \leq \sin 7 + 2$
	$= 5 \cos 2 + 7 \cos 2$
9)	153 sin 27
- >	$31 \leq 8in^2 + 3$
	3 L { 1 - (cos) t } (1) (1) (1) (1)
	$\frac{3}{2} \left\{ \frac{1 - (\cos 2 + 2)}{2} = \frac{3}{2} \left[\frac{1}{3} \right] \right\}$
	$\frac{3}{2}(5) - \frac{3}{2}(5)$
	$\frac{3}{2}\left(\frac{1-5+4}{5}\right)$
10)	L & 4 (0 s ² t 3
	4 L { 1+cos2:t}
	2 + 1
ν L	Se-3+ Sin2+3 By 1st Shifting Property
	$L = \{e^{at} \notin \{t\}\} = [f(s)]_{s=s=q}$

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Date
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$$f(s) = 1 \{ f(t) \} = 1 \{ sin^2 t \}$$

= 1 \ \ 1 - (\omegas 2 \cdot \)

$$= 1 \left[1 - 5 \right]$$

$$= 2 \left[5 \right]$$

$$= 5^{2} + 4$$

$$L \leq e^{\alpha \xi} f(\xi) = \int_{2}^{\infty} \left(\frac{1-5}{5} \right)^{3}$$

$$= \begin{bmatrix} 1 & (1) & -5 + 3 & (5 + 3)^2 + 4 \end{bmatrix}$$

$$= \frac{1}{2} \{ \{ \{ \{ \} \} \} = \{ \{ \{ \{ \} \} \} \} \}$$

$$= \frac{1}{2} \left[\frac{1+5}{5} \right]$$

$$= \frac{1}{2} \left[\frac{1+5}{5} \right]$$

$$= \frac{1}{2} \left[\frac{1+5}{5} \right]$$

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Inp (AU)	The second secon	and the second s
13> Find L & 5 sin 3 + 7		
-> we know that	angle grand on the freedom with the service of the	
Sin 3 = 3 sin t - 4 sin 3 2		
" 4 8in 3t = 3 Sin t - 4 Sin 3 t	And the second s	120
$\sin^3 t = 1 \left[3 \sin t - \sin^3 t \right]$	per na vigila dia anticipi di Marridia di supi hana salgenti di ligali, chi cinoma	
		to the second second second
: L { 5 sin 2 } = 5 L { 8 in 3 t }	gant de personant en en de la company de	
= 5 5 3 sin t - sin 3 t }		
		(E)
$\frac{1.255\sin^3 t^3 = 5}{4(5^2+1)} = \frac{3}{5}$	2+9,	
9 (52+1) (5	49,	
$=\frac{15}{4}\left(\frac{1}{2}+1\right)$		
4 (51+1)/11	-52+9)	47
200		Electric Control of the Control of t
14) t = 1 = 2 cos + 3		
	1	57
cas3 t = 4 cas3 t - 3 cox	77	V ne
1.0037 = (0.37 + 3.005)		
And don't it is	1) 0)4	
(cos3+=1 (cos3++3 cost)		
4 1 2 0		107
$1.152\cos^3 t^3 = 215\cos^3 t^3$	<u> </u>	
	. 2	
-: 2 L { (cos3 +) = 2 L } (cos3 + +3 (os to	3. (1) (1)
- (100
$2 \cdot 1 \cdot 2 \cdot $	5	
4 L5 19 (S	5+111	· 36
= 2 /5 + =	35	
$= 2 \int S + 1$ $4 \int S^2 + 9$	541	
= 255 [1 + 3		
$= 255$ 1 + 3 $\frac{1}{5^2+9}$ 5	+1)	

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* Laplace Transform = by Multiplication Poemo.
Then is $L \xi + F(t) \xi = C - U d F(s)$ Then is $L \xi + F(t) \xi = C - U d f(s)$
Note: is $d = (-1)^2 d^2 + (s)$ ds^2 ds^2
$\frac{1}{100} \frac{1}{100} = \frac{1}{100} \frac{1}{100} = \frac{1}{100} \frac{1}{100} = \frac{1}{100} \frac{1}{100} = $
iji d v. v = vd v + vdv vdv + vdu
$\begin{array}{c c} \hline & & \\ \hline $
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
Using Property
$\frac{1 + f(t)^{3} = c - vot + f(s)}{delds}$
$= (-1) \frac{d}{ds} \left(\frac{s^2}{s^2 - 16} \right)$ $= (-1) \frac{d}{ds} \left(\frac{s^2}{s^2 - 16} \right)$
$\frac{2}{\sqrt{5^2 \cdot 16J^2}}$

Classmate

Date
Page

$$= - \left[\frac{5^2 - 16 - 25^2}{(5^2 - 16)^2} \right]$$

$$= - \left[-\frac{5^2 - 16}{(5^2 - 16)^2} \right]$$

$$= \frac{5^2 + 16}{(5^2 - 16)^2}$$

$$L \{ \pm (\cosh 4t) = 5^2 + 16$$

$$(5^2 + 16)^2$$

$$L \{ \{ \{ \{ \{ \{ \} \} \} \} = \{ \{ \{ \} \} \} \}$$

Using Property

$$1 \{ t^2 + (t) \} = (-1)^2 df(s)$$

$$\frac{-1}{2} \left[\frac{1}{5-5} \right]$$

$$[5-5]^2$$

	Date Page
	1) L { + dun 2 + }
	1 \(\frac{1}{2} \) \(\frac{1} \) \(\frac{1} \) \(\frac{1}{2} \) \(\frac{1}{2} \
	$F(t) = F(t) = \sin 2t, F(s) = 2$
	$\frac{1}{1} \cdot \frac{1}{2} + \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{2} = \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{2} = \frac{1}{2} = \frac{1}{2} = \frac{1}{2} = \frac{1}{2} = \frac{1}$
	$= \frac{2}{(s^2+4)^2}$
18>	1 { V t } = 1 { t 2} = [1+1
	5 2 1 5 2 1 1 (0 3)
	2 2 2 3 3 12
	(3)7 S P (5) TO TO TO THE SOLE OF THE SOLE
	5.3/2
*	laplace Transform by division of Pawers of t
	Jb, L(f(t)}=F(s)
	then $1 \leq F(t) = \int F(s) ds$
34	Noto: $-i$ 1. $ds = log S-a + c$
	$\frac{1}{\left(\frac{1}{5^2+a^2}\right)} \frac{ds}{ds} = \frac{1}{9} \frac{\tan^{-1}\left(\frac{s}{9}\right) + c}{\left(\frac{s}{9}\right) + c}$

1-11-1		
(F'(2)	- 1009	F(n)
F(21)	CH T	



in Eg. \$ 19 | Find 1 { = 42 8in + }

Koro. F(t) = 6,2 t

1-cos2t=28in2t

 $\frac{1}{2} = \frac{1}{2} \left[\frac{1}{2} \sin^2 t \right]$

= 1 [1-(0)2@t]

:. L { F(t) } = 1 / { 1- co12 t }

= 1 + (1 - 5) = 1 + (5) = 5 + 4

Now.

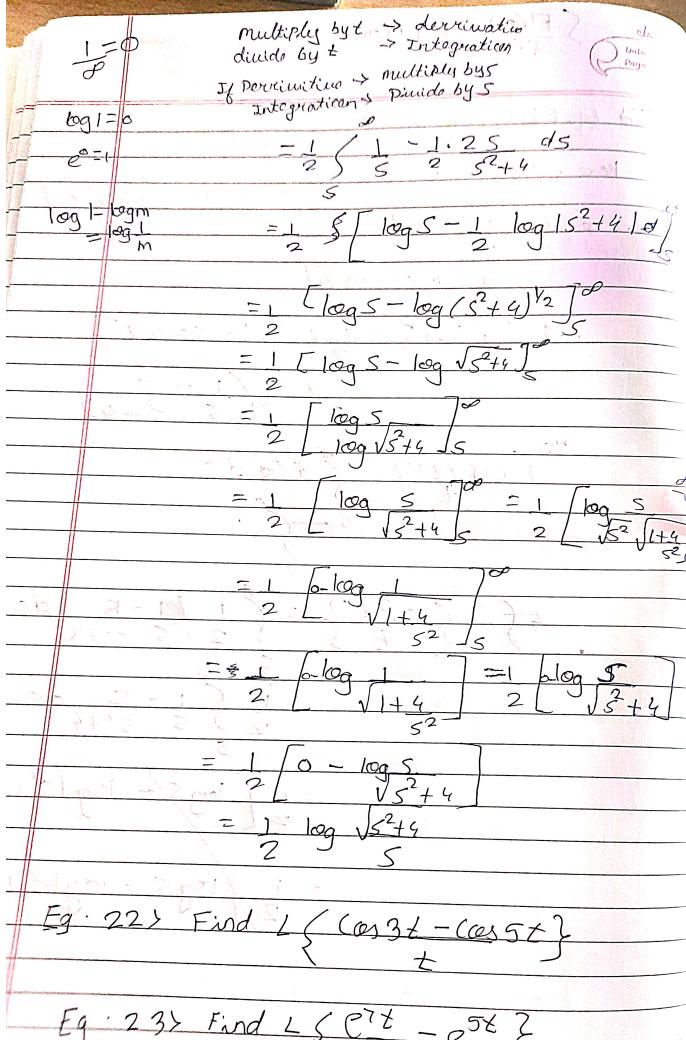
2 { F(+) } = { F(s)ds}

 $t \left\{ 1 \left\{ \frac{\sin^2 t}{t} \right\} = \int_{-2}^{2} \left(\frac{1-5}{5} \right) ds$

 $= \frac{1}{2} \int_{\frac{1}{2}}^{\frac{1}{2}} \frac{s}{s^{2}+4} ds$

 $= \frac{1}{2} \left[\frac{\log 5}{-\log 15^2 + 4} \right]$

 $=\frac{1}{2}\left[\frac{\log 5 - \log |5| + 4|}{2}\right]$



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	eg. 23> £ \$ (053 £ - (0552
	15076-05-67 +
	F(t) = e7t - e5t?
	$f(t) = e^{-1} - e^{-2t}$ $1 \leq f(t) \leq -1 \leq -$
	= 1 - 1 - 5 - 5
	$N(0) = (F(t))^2 = (F(s)) ds$
	Now $1 \leq F(t) = \int F(s) ds$
	$2S = -e^{5t} = 1 - 1 ds$ $2S = -e^{5t} = 1 - 1 ds$
	\$ t
	$= \log(s-7) - \log(s-5)$
48	$= \int \log 5 - 7 \int_{5-5}^{\infty}$
	$= \log \left[\frac{5-5}{5} \right]$
	0[5-7]
	- 11 (cos 3t - cos 5t)
	279) Find L (Cos 3t - Cos 5t) 3t
	$\frac{f(t) = (cos 3t - (cos 5t)}{2 + (t)} = 1 + (cos 3t - (cos 5t))$
	$= \frac{5}{5^2 + 9} = \frac{5}{5^2 + 25}$
	<u>[5+1</u>

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Naw,	
1 (F(t) ? = (I(s) ds	
$L \left\{ (\cos 3t - \cos 5t)^2 = \left(\frac{5}{5} - \frac{5}{4} \right) \right\}$	
$= \int_{2}^{1} \log s^{2} + 9 - \log s^{2} + 25 $	
$= \frac{1}{2} \left[\log_{10} \frac{5^{2} + 9}{5^{2} + 25} \right]$	40
$= 1 \left[\frac{1}{2} \right] \frac{5^2 + 25}{5^2 + 9}$	
0x: 247 L (cas5+ - cas 3+ }	
$F(t) = \cos 5t - \cos 3t$	_
$1 \le F(t) = 1 \le (\cos 5t - (\cos 3t))$ = $\frac{5}{5^2 + 25} = \frac{5}{5^2 + 9}$	
Now $ \frac{1}{1} \leq F(f) = \frac{1}{1} = $	
$\frac{t}{1} = \frac{5}{5} = \frac{5}{5^{2} + 25} = \frac{5}{5^{2}$	

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Date Page
=1(25 -25 ds
2) 5 ² +25 5 ² +9
$= \frac{1}{2} \left[\log \left(\frac{15^2 + 251 - \log \left(\frac{15^2 + 7591}{2} \right)}{2} \right]$
$= 1 \left[\frac{10q}{10q} \right]^2 + 25$
2 52+9
$= 1 \log \xi + 2$
$2 \boxed{1.5 \pm 25}$
$= \log 5^2 + 9$
V S T ZS
Laplace transform of derrivative:
$\frac{1}{5} \frac{1}{5} \frac{1}$
Dir Sylvan dt
$\frac{11}{11} \frac{1}{12} \frac{1}{12} = \frac{1}{11} \frac{1}{12} \frac{1}{12$
$\frac{1}{2} \left(\frac{1}{2} \right)^{2} = \frac{1}{2} \left(\frac{1}{2} \right)^{2}$
$\frac{2}{3} \frac{1}{3} \frac{1}{3} \frac{1}{3} = \frac{3}{3} \frac{1}{3} $
$\frac{11121 \left(\frac{3}{3} \right)^{3} - 1 \left(\frac{3}{4} \right)^{2} = \frac{3}{5} $

	Q in
Laplace Tuanyoum tof Integration.	
If 2 { y (t)}= y (s) then	
i) 1 { 5 5 CW du } - E(s)	
$\frac{t}{1} = \frac{t}{1} = \frac{t}$	
20.0-	
Find & cosh t (e" cosh udu	
w-92019 eg. 26. Evaluato Se sint dt	
w-2022 eg.27. Evaluate (cos 47 - cos 36 dt)	*4°65 \
(as 47 - (as 36 d-)	
eg 28. Find L (e - 36 sin 2)	
eg 29. Find L. T of F(x) = \$1 06+61	
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