NATIONAL INSTITUTE OF TECHNOLOGY SURATHKAL

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LAB ASSIGNMENT :-03

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COURSE :- B.TECH (INFORMATION TECHNOLOGY)

SUBJECT :- IT204 (SIGNALS AND SYSTEMS LAB)

SUBMITTED TO :-

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```
from sympy import*
import sympy as sp
import numpy as np
from numpy import*

A, t, t1, T, n, N=symbols( 'A, t, t1, T, n, N')
init_printing(pretty_print=True)
Integral(A**2, (t, -t1/2, t1/2))
Energy=integrate(A**2, (t, -t1/2, t1/2))
display('Energy of the signal E1=' , Energy)
E1=Energy

Power=limit((Integral(A**2, (t,-t1/2,t1/2))/T),T,oo)
display( 'Power of the signal P1=', Power)
P1=Power

if E1==oo and P1!=0 and P1!=oo:
  display('x(t) is Power signal')
if P1==0 and E1!=0 and E1!=oo:
  display('x(t) is Energy signal' )
if E1==oo and P1!=oo and P1==0:
  display('x(t) is Neither Energy Nor Power signal')
if E1==oo and P1==oo:
  display('x(t) is Neither Energy Nor Power signal')
if E1==0 and P1==0:
  display('x(t) is Neither Energy Nor Power signal')
```

```
'Energy of the signal E1='
```

$$A^2 t_1$$

```
'Power of the signal P1='
```

$$0$$

```
'x(t) is Energy signal'
```

```
from sympy import*
import sympy as sp
import numpy as np
from numpy import*

Integral((sp.cos(t)**2),(t,-oo,oo))
Energy=integrate((sp.cos(t)**2),(t,-oo,oo))
display('Energy of the signal E2=' , Energy)
E2=Energy

Integral((sp.cos(t)**2)/T,(t,-T/2,T/2))

Power=limit(integrate((sp.cos(t)**2)/T,(t,-T/2,T/2)),T,oo)
display( 'Power of the signal P2=', Power)
P2=Power

if E2==oo and P2!=0 and P2!=oo:
  display('x(t) is Power signal')
if P2==0 and E2!=0 and E2!=oo:
  display('x(t) is Energy signal' )
if E2==oo and P2!=oo and P2==0:
  display('x(t) is Neither Energy Nor Power signal')
if E2==oo and P2==oo:
  display('x(t) is Neither Energy Nor Power signal')
if E2==0 and P2==0:
  display('x(t) is Neither Energy Nor Power signal')
```

```
'Energy of the signal E2='
∞
'Power of the signal P2='
1/2
'x(t) is Power signal'
```

```
from sympy import*
import sympy as sp
import numpy as np
from numpy import*
A, t, t1, T, n, N=symbols( 'A, t, t1, T, n, N')
init_printing(pretty_print=True)

Energy=Sum(((1/4) **n) **2, (n,0,oo))
E3=Energy.evalf()
display('Energy E3=', E3)
Power3=Sum(((1/4)**n)**2, (n,0,N)) / (2*N)
y=Power3.doit()
Power1=limit(y,N,oo)
P3=Power1
display('Power P3=' ,P3)

if E3==oo and P3!=0 and P3!=oo:
  display('x(t) is Power signal')
if P3==0 and E3!=0 and E3!=oo:
  display('x(t) is Energy signal')
if E3==oo and P3!=oo and P3==0:
  display('x(t) is Neither Energy Nor Power signal')
if E3==oo and P3==oo:
  display('x(t) is Neither Energy NP signal')
if E3==0 and P3==0:
  display('x(t) is NENP signal')
```

```
'Energy E3='
1.0
'Power P3='
0
'x(t) is Energy signal'
```

```
from sympy import*
import sympy as sp
import numpy as np
from numpy import*

x=Integral(((t)**(-1/2))**2,(t,2,oo))
Energy=x
Energy

y=integrate(((t)**(-1/2))**2,(t,2,oo))
E4=y
display('Energy E4=',y)

x1=(1/T)*Integral(((t)**(1/2))**2,(t,2,T/2))
x1

y1=limit((1/T)*integrate(((t)**(-1/2))**2,(t,2,T/2)),T,oo)
display('Power P4=',y1)
P4=y1

if E4==oo and P4!=0 and P4!=oo:
  display('x(t) is Power signal')
if P4==0 and E4!=0 and E4!=oo:
  display('x(t) is Energy signal' )
if E4==oo and P4!=oo and P4==0:
  display('x(t) is Neither Energy Nor Power signal')
if E4==oo and P4==oo:
  display('x(t) is Neither Energy NP signal')
if E4==0 and P4==0:
  display('x(t) is NENP signal')
```

```
'Energy E4='
∞
'Power P4='
0
'x(t) is Neither Energy Nor Power signal'
```

```
from sympy import*
import sympy as sp
import numpy as np
from numpy import*

y = integrate((-4)**2,(t,0,2))+ integrate(4**2,(t,2,4)) + integrate((-4)**2,(t,4,6))
E5 = y
display('Energy E5=',y)

y2 = limit((1/T)*integrate((-4)**2,(t,0,2)),T,oo) + limit((1/T)*integrate((4)**2,(t,2,4)),T,oo) +limit((1/T)
display('Power P5=', y2)
P5 = y2

if E5==oo and P5!=0 and P5!=oo:
  display('x(t) is Power signal')
if P5==0 and E5!=0 and E5!=oo:
  display('x(t) is Energy signal' )
if E5==oo and P5!=oo and P5==0:
  display('x(t) is Neither Energy Nor Power signal')
if E5==oo and P5==oo:
  display('x(t) is Neither Energy NP signal')
if E5==0 and P5==0:
  display('x(t) is NENP signal')
```

```
'Energy E5='
96
'Power P5='
0
'x(t) is Energy signal'
```

SR. NO	Energy Output	Power Output	Category (Mentioned)	
1	A^2t_1	0	x(t) is Energy signal	
2	∞	1/2	x(t) is Power signal	
3	1.0	0	x(t) is Energy signal	
4	∞	0	x(t) is Neither Energy Nor Power signal	
5	96	0	x(t) is Energy signal	

$x(n) = [1, 3, 2, 1, 2, 2, 1, 1, 3, 2]$

$h(n) = [1, 0, 8, 0, 4, 0, 0, 1]$

$N = 10 + 8 - 1 = 17$

$y(n)$ / $x(n)$	1	3	2	1	2	2	1	1	3	2
$h(n)$										
1	1	3	2	1	2	2	1	1	3	2
0	0	0	0	0	0	0	0	0	0	0
8	8	24	16	8	16	16	8	8	24	16
0	0	0	0	0	0	0	0	0	0	0
4	4	12	8	4	8	4	4	12	8	
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
1	1	3	2	1	2	2	1	1	3	2

$x(n) = [2, 1, 3, 2, 1]$
$h(n) = [4, 3, 2, 1]$

$N = 5+4-1 = 8$

y(n) \ x(n)	2	1	3	2	1
h(n)					
4	8	4	12	8	4
3	6	3	9	6	3
2	4	2	6	4	2
1	2	1	3	2	1

$y(n) = [8, 10, 19, 21, 17, 10, 4, 1]$

$x(n) = [3, 2, 1, 0, 0, 0]$
$h(n) = [1, 1, 1]$
$N = 6+3-1 = 8$

y(n) \ x(n)	3	2	1	0	0	0
h(n)						
1	3	2	1	0	0	0
1	3	2	1	0	0	0
1	3	2	1	0	0	0

$y(n) = [3, 5, 6, 3, 1, 0, 0, 0]$

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$x(n) = [1, 1, 1]$

$h(n) = [1, 0.5, 0.25]$

$N = 3 + 3 - 1 = 5$

y(n)	x(n) 1	1	1
h(n)			
1	1	1	1
0.5	0.5	0.5	0.5
0.25	0.25	0.25	0.25

$x(n) = [1, 0, 1, 0, 1, 1, 1, 1]$

$h(n) = [1, 1, 1]$

$N = 8 + 3 - 1 = 10$

y(n)	x(n) 1	0	1	0	1	1	1	1
h(n)								
1	1	0	1	0	1	1	1	1
1	1	0	1	0	1	1	1	1
1	1	0	1	0	1	1	1	1

$y(n) = [1, 1, 2, 1, 2, 2, 3, 3, 3, 2, 1]$