

S	M	T	W	T	F	S
31			1	2		
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

October 2010



2010 SEPTEMBER

Monday **20**

Assignment - 5

Q.1] (a) $E_1 = \sum_{n=-\infty}^{\infty} |A[n]|^2$

$$= \sum_{n=0}^{\infty} 1$$

$$= \infty$$

$$(\text{Avg. Power}) = \lim_{k \rightarrow \infty} \frac{1}{(2k+1)} \sum_{n=-k}^{k} |A[n]|^2$$

$$= \lim_{k \rightarrow \infty} \frac{1}{(2k+1)} \sum_{n=0}^{k} 1$$

Tuesday **21**

$$= \lim_{k \rightarrow \infty} \frac{1}{(2k+1)} (k+1)$$

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

2010
SEPTEMBER



S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

August 2010

22 Wednesday

$$\begin{aligned}
 (b) \quad E_2 &= \sum_{n=-\infty}^{\infty} |n u[n]|^2 \\
 &= \sum_{n=0}^{\infty} n^2 \\
 &= \infty
 \end{aligned}$$

$$\begin{aligned}
 (\text{Avg. Power})_2 &= \lim_{k \rightarrow \infty} \left(\frac{1}{2k+1} \right) \sum_{n=-k}^{k} |n u[n]|^2 \\
 &= \lim_{k \rightarrow \infty} \frac{1}{(2k+1)} \sum_{n=0}^k n^2
 \end{aligned}$$

23 Thursday

$$\begin{aligned}
 &\stackrel{?}{=} \lim_{k \rightarrow \infty} \frac{1}{(2k+1)} \frac{(k)(k+1)(2k+1)}{6} \\
 &= \lim_{k \rightarrow \infty} \frac{k^2+k}{6} \\
 &= \infty
 \end{aligned}$$

S	M	T	W	F	S
31			1	2	
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17	18	19	20	21	22
24	25	26	27	28	29
30					

OCTOBER 2010



SEPTEMBER

Friday 24

$$(c) E_3 = \sum_{n=-\infty}^{\infty} |4 \sin(0.5\pi n)|^2$$

$$= \sum_{n=-\infty}^{18} 16 |\sin(0.5\pi n)|^2$$

$$= 2 \sum_{n=1}^{\infty} 16 \left| \sin\left(\frac{\pi(2n-1)}{2}\right) \right|^2$$

$$= 32 \sum_{n=1}^{\infty} 1$$

$$= 8$$

$$(\text{Avg. Power})_3 = \lim_{k \rightarrow \infty} \frac{1}{(2k+1)} \sum_{n=-k}^k |4 \sin(0.5\pi n)|^2$$

Saturday 25

$$= 16 \lim_{k \rightarrow \infty} \frac{1}{(2k+1)} 2 \sum_{n=1}^k \left| \sin\left(\frac{\pi(2n-1)}{2}\right) \right|^2$$

If $k = \text{even}$, then:

$$(\text{Avg. Power})_3 = 32 \lim_{k \rightarrow \infty} \left(\frac{1}{2k+1} \right) \left(\frac{k}{2} \right)$$

$$= \lim_{k \rightarrow \infty} \frac{16k}{2k+1}$$

$$= 8$$

26 Sunday

SEPTEMBER



S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

August 2010

27 Monday

If $k = \text{odd}$, then:

$$(\text{Avg. Power})_3 = 32 \lim_{k \rightarrow \infty} \frac{1}{(2k+1)} \left(\frac{k+1}{2} \right)$$

$$= \lim_{k \rightarrow \infty} \frac{16(k+1)}{(2k+1)}$$
$$= 8$$

28 Tuesday

Wednesday **29**

Q.2)

$$\tilde{s}[n] = \cos\left(\frac{7\pi n}{20}\right)$$

$$\omega_0 = \frac{7\pi}{20}$$

$$\left(\frac{7\pi}{20}\right)N_0 = 2\pi m$$

$$N = \frac{40}{7}m$$

For $m=7$, $N_0=40$

So, Fundamental period = 40

Thursday **30**

$$\text{Consider } \tilde{\omega}[n] = \cos\left(\left(\frac{7\pi}{20} + 2\pi\right)n\right)$$

$$= \cos\left(\frac{7\pi n}{20} + 2\pi n\right)$$

$$= \cos\left(\frac{7\pi n}{20}\right) = \tilde{s}[n]$$

$$\text{So, } \tilde{\omega}[n] = \cos\left(\frac{47\pi n}{20}\right) \text{ and}$$

$$\tilde{x}[n] = \cos\left(\frac{87\pi n}{20}\right) \text{ are}$$

2 other sinusoidal sequences with the same fundamental period as $\tilde{s}[n]$.

S	M	T	W	F	S
1	2	3	4		
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12	13	14	15	16	17
19	20	21	22	23	24
26	27	28	29	30	



September 2010

OCTOBER

1 Friday

$$(a) \quad r[n] = r[-1]s[n+1] + r[0}s[n] + r[1}s[n-1] \\ + r[2}s[n-2] \\ + r[3}s[n-3] \\ + r[4}s[n-4]$$

$$r[n] = \sum_{k=-1}^4 r[k]s[n-k]$$

$$(b) \quad r[n] = r[-1](\mu[n+1] - \mu[n]) \\ + r[0](\mu[n] - \mu[n-1]) \\ + r[1](\mu[n-1] - \mu[n-2]) \\ + r[2](\mu[n-2] - \mu[n-3]) \\ + r[3](\mu[n-3] - \mu[n-4]) \\ + r[4](\mu[n-4] - \mu[n-5])$$

$$r[n] = \sum_{k=-1}^4 r[k](\mu[n-k] - \mu[n-k-1])$$

(c) For unit sample representation:

3 Sunday

$$\text{Even}\{r[n]\} = \frac{r[n] + r[-n]}{2}$$

$$= \sum_{k=-4}^4 r[k]s[n-k] + \sum_{k=-4}^4 r[k]s[-n-k]$$

S	M	T	W	F	S
1	2	3	4	5	6
7	8	9	10	11	12
14	15	16	17	18	19
21	22	23	24	25	26
28	29	30			



OCTOBER
2010

Monday

4

$$= \frac{\sum_{k=-4}^4 r[k] s[n-k] + \sum_{k=-4}^4 r[k] s[n+k]}{2}$$

$$= \frac{\sum_{k=-4}^4 r[k] (s[n-k] + s[n+k])}{2}$$

$$\text{Odd } \{r[n]\} = \frac{\sum_{k=-4}^4 r[k] s[n-k] - \sum_{k=-4}^4 r[k] s[-n-k]}{2}$$

Tuesday

5

$$= \frac{\sum_{k=-4}^4 r[k] (s[n-k] - s[n+k])}{2}$$

For unit step representation:

$$\text{Even } \{r[n]\} = \frac{r[n] + r[-n]}{2}$$

$$= \frac{\sum_{k=-4}^4 r[k] (\mu[n-k] - \mu[n-k-1])}{2} + \frac{\sum_{k=-4}^4 r[k] (\mu[n-k] - \mu[n-k-1])}{2}$$

2

OCTOBER



S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

6 Wednesday

$$\text{Odd } \{ \tau[n] \} = \frac{\tau[n] - \tau[-n]}{2}$$

$$= \sum_{k=-h}^h \tau[k] (\mu[n-k] - \mu[n-k-1]) - \sum_{k=-h}^{n-h} \tau[k] (\mu[n-k] - \mu[n-k-1])$$

—

2

Even sequence = $\{2, \frac{5}{2}, -1, -\frac{3}{2}, 4, -\frac{3}{2}, -1, \frac{5}{2}, 2\}$

Odd sequence = $\{-2, -\frac{5}{2}, 1, \frac{3}{2}, 0, -\frac{3}{2}, -1, \frac{5}{2}, 2\}$

7 Thursday

S	M	T	W	T	F	S
1	2	3	4	5	6	
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				



2010
OCTOBER

Friday 8

8.4] $x[n] \rightarrow [12] \rightarrow x[n/2]$

$$x[n/2] = n \mu[n/2]$$

$$x[n/2] \rightarrow [z^{-1}] \rightarrow x[n/2 - 1]$$

$$x[n/2] \rightarrow [z] \rightarrow x[n/2 + 1]$$

Saturday 9

$$x[n/2 - 1] \xrightarrow{0.5} \frac{1}{2} x[n/2 - 1]$$

$$x[n/2 + 1] \xrightarrow{0.5} \frac{1}{2} x[n/2 + 1]$$

$$y[n] = \frac{1}{2} \left\{ x[n/2 - 1] + x[n/2 + 1] \right\}$$

10 Sunday

$$= \frac{1}{2} \left\{ (n-2) \mu[n/2 - 1] + (n+2) \mu[n/2 + 1] \right\}$$

$$\mu[n/2 - 1] = \begin{cases} 1, & n \geq 2 \\ 0, & n < 2 \end{cases}$$

2010

OCTOBER



S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

11 Monday

$$u\left[\frac{n}{2} + 1\right] = \begin{cases} 1, & n \geq -2 \\ 0, & n < -2 \end{cases}$$

$$\text{So, } y[n] = \frac{1}{2} \left\{ (n-2) + (n+2) \right\} = n$$

for $n \geq 2$

$$y[n] = \frac{1}{2} \left\{ (n+2) \right\} = \frac{n+2}{2}$$

for $-2 \leq n < 2$

12 Tuesday

$$y[n] = 0 \quad \text{for } n < -2$$

OCTOBER



September 2010	1	2	3	4
	5	6	7	8
	9	10	11	
	12	13	14	15
	16	17	18	
	19	20	21	22
	23	24	25	
	26	27	28	29
	30			

15 Friday

$$Q5) p_a[n] = p_a(t) \Big|_{t=nT} = p_a(nT), -\infty < n < \infty$$

$$T = \frac{1}{F_T} = \frac{1}{50} = 0.2$$

So,

$$p[n] = 3 \cos\left(\frac{2\pi n}{5}\right) - 7 \sin\left(\frac{\pi n}{2}\right) + 5 \cos\left(\frac{8\pi n}{5}\right) + 4 \cos\left(\frac{5\pi n}{2}\right)$$

$$- 6 \cos\left(\frac{22\pi n}{5}\right)$$

16 Saturday

$$\text{Now, } \cos\left(\frac{22\pi n}{5}\right) = \cos\left(\frac{2\pi n + 20\pi n}{5}\right)$$

$$= \cos\left(\frac{2\pi n + 4\pi n}{5}\right)$$

$$= \cos\left(\frac{2\pi n}{5}\right)$$

17 Sunday

$$\cos\left(\frac{8\pi n}{5}\right) = \cos\left(-\frac{2\pi n}{5} + 2\pi n\right)$$

$$= \cos\left(-\frac{2\pi n}{5}\right) = \cos\left(\frac{2\pi n}{5}\right)$$

S	M	T	W	T	F	S
1	2	3	4	5	6	
7	8	9	10	11	12	13
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28	29	30				



2010

Monday **18**

$$\text{So, } P[n] = 2\cos\left(\frac{2\pi n}{5}\right) + 4\cos\left(\frac{5\pi n}{2}\right) - 7\sin\left(\frac{\pi n}{2}\right)$$

Tuesday **19**

2010

OCTOBER



S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

September 2010

20 Wednesday

Q.6] (a) $\tilde{x}[n] = \sin\left(\frac{\pi n}{10}\right)$

$$\left(\frac{\pi n}{10}\right) N_o = 2\pi$$

$$N_o = 20$$

(b) $\tilde{x}[n] = \sin\left(\frac{2\pi n}{5}\right)$

$$\frac{2\pi n}{5} N_o = 2\pi$$

$$N_o = 10$$

21 Thursday

(c) $\tilde{x}[n] = \sin\left(\frac{4\pi n}{5}\right)$

$$\left(\frac{4\pi}{5}\right) N_o = 4\pi$$

$$N_o = 5$$

(d) $\tilde{x}[n] = \sin\left(\frac{18\pi n}{20}\right) = \sin\left(\frac{9\pi n}{10}\right)$

$$N_o \frac{9\pi}{10} = 2\pi k \Rightarrow N_o = 9$$