ECS 455 2014: Quiz 1 Solution

Instructions

1. Separate into groups of no more than three persons.
2. Only one submission is needed for each group. Late submission will not be accepted.
3. ***Write down all the steps*** that you have done to obtain your answers. You may not get full credit even when your answer is correct without showing how you get your answer.
4. **Do not panic.**

Name	ID
Prapun	

Find the average power of each of the signals given below.

1. $g(t) = 2e^{2jt}$

We know that $g(t) = Ae^{j(2\pi f_c t + \theta)} \Rightarrow P_g = |A|^2$.

Here, $A = 2$. Therefore, $P_g = 2^2 = 4$

2. $g(t) = 2\cos\left(2t + 2^\circ\right)$

We know that $g(t) = A\cos(2\pi f_c t + \theta) \Rightarrow P_g = \frac{A^2}{2}$

Here, $A = 2$. Therefore, $P_g = \frac{2^2}{2} = \frac{4}{2} = 2$

3. $g(t) = 2\cos\left(2t + 2^\circ\right) + 2\cos\left(2t + 2^\circ\right) = 4\cos(2t + 2^\circ)$

We know that $g(t) = A\cos(2\pi f_c t + \theta) \Rightarrow P_g = \frac{A^2}{2}$

Here, $A = 4$. Therefore, $P_g = \frac{4^2}{2} = \frac{16}{2} = 8$

4. $g(t) = 2\cos\left(2t + 2^\circ\right) + 22\cos\left(22t + 22^\circ\right)$

$= 2 \times \frac{1}{2}\left(e^{j(2t+2^\circ)} + e^{-j(2t+2^\circ)}\right) + 22 \times \frac{1}{2}\left(e^{j(22t+22^\circ)} + e^{-j(22t+22^\circ)}\right)$

Note that the four terms here have different frequencies:

$\frac{2}{2\pi}, \frac{-2}{2\pi}, \frac{22}{2\pi}, -\frac{22}{2\pi}$.

We know that $g(t) = \sum_k c_k e^{j2\pi f_k t} \Rightarrow P_g = \sum_k |c_k|^2$

$= \left|1e^{j2^\circ}\right|^2 + \left|1e^{-j2^\circ}\right|^2 + \left|11e^{j22^\circ}\right|^2 + \left|11e^{-j22^\circ}\right|^2 = 1 + 1 + 11^2 + 11^2 = 244$