Problem #1

a) \( R(0) = A \)
b) Yes

c) \( A/6 \)

d) \[ A/6 \sqrt{\frac{1}{2T}} \]

We also have a periodic signal which can be written as (period = 2T)

\[ \sum_{n=-\infty}^{\infty} c_n e^{j2\pi n T/2T} \]
Total Power = \infty

NO - D-C Component
(No \mathcal{F}(F) in Freq. domain)
Problem #2

We can rewrite as

\[ X(t) = \frac{5A}{\Theta} + \frac{A^2}{\Theta} \ln \left( \frac{5A/\Theta}{3A/\Theta} \right) \]

\[ P_x(\tau) = \left( \frac{5A/\Theta}{3A/\Theta} \right)^2 e^{-2 \lambda \tau} \]

(a)

\[ (\frac{5A/\Theta}{3A/\Theta})^2 + (\frac{5A/\Theta}{2A/\Theta})^2 = (\frac{39}{8})A^2 \]

\[ \text{Avg. Power} = A^2 \int_0^T (\xi)^2 d\xi = \frac{A^2 \cdot \frac{A^2}{16}}{2} \]

\[ = \frac{17A^2}{3z} \]

(b)

\[ (5A/\Theta)^2 \int (\xi) \]

(c) = Avg. Power = \( A^2 + \frac{A^2}{16} \) = \( \frac{17A^2}{3z} \)
Problem 4.3

a) \( E_x(t) = E \left[ A \cos \omega t + B \sin \omega t \right] = 0 \)

\[
E_x(t) = \left\{ \begin{array}{l}
E_x A \cos \omega t + B \sin \omega t \text{ for } 0 \leq t < 2T \\
E_x A \cos \omega t + B \sin \omega t \text{ for } 2T \leq t < 4T \\
E_x A \cos \omega t + B \sin \omega t \text{ for } 4T \leq t < 6T \\
E_x A \cos \omega t + B \sin \omega t \text{ for } 6T \leq t < 8T \\
\end{array} \right.
\]

\[
E_x = E_x A^2 \left[ \cos \omega \omega T + \cos \omega \omega (2T+2) \right] + E_x B^2 \left[ \cos \omega \omega 2T - \cos \omega \omega (2T+2) \right] + E_x A^2 B \left[ \cos \omega \omega T - \cos \omega \omega (2T+2) \right]
\]

\( \mathbb{E} x(t) = \sigma^2 \cos \omega T \)

YES!

b) Yes, if it is not white because \( E_x(t) \) is function of \( t \)

b) Not Ergodic in mean

\[
\frac{1}{T} \int x(t) dt = 0 \text{ for two cases}
\]

c) Not Ergodic in \( \mathbb{R}(x) \)

\[
\frac{1}{T} \int x(t) dt = 0 \text{ for one case}
\]