Problem #1

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

b) Yes

c) \( A/6 \)

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

\[
\sum_{n=-\infty}^{\infty} C_n e^{j2\pi n \frac{t}{2T}}
\]
- Total Power = $\infty$
- NO - D-C Component
  (No $f(t)$ in Freq. domain)
Problem #2

We can rewrite as

\[ x(t) = \frac{5A}{\tau} + \left\{ \begin{array}{ll}
\frac{3A}{\tau} & t < -\frac{3\tau}{8} \\
0 & -\frac{3\tau}{8} < t < \frac{3\tau}{8} \\
\frac{3A}{\tau} & t > \frac{3\tau}{8}
\end{array} \right. \]

\[ R_x(\tau) = \left( \frac{3A}{\tau} \right)^2 e^{-2\tau} \]

a)

\[ \left( \frac{3A}{\tau} \right)^2 + \left( \frac{3A}{\tau} \right)^2 = \left( \frac{3A}{\tau} \right)^2 \]

\[ \text{Avg. Power} = A^2 + \frac{\left( \frac{A}{\tau} \right)^2}{2} = \frac{A^2 + \frac{A^2}{2\tau}}{2} \]

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

b)

\[ \left( \frac{5A}{\tau} \right)^2 \int f(t) \]

c) = Avg. Power = \[ A^2 + \frac{A^2}{14} \]
Problem #3

a) \( E \{ x(t) \} = E \{ A \cos 2\pi W t \} \)

\[ E \{ B \} \sin 2\pi W t = 0 \]

\[ E \{ x(t+2) - x(t) \} = \]

\[ E \left\{ (A \cos 2\pi W (t+2) + B \sin 2\pi W (t+2)) \right\} \]

\[ \cdot (A \cos 2\pi W t + B \sin 2\pi W t) \]

\[ = E \{ A^2 \} \left[ \cos 2\pi W t + \cos 2\pi W (2t+2) \right] \]

\[ + E \{ B^2 \} \left[ \cos 2\pi W t - \cos 2\pi W (2t+2) \right] \]

\[ + E \{ AB \} E \{ B \} \]

\[ = 0 \]

\[ Q_x(t) = 0^2 \cos 2\pi W t \]

YES!

b) Yes; It is not i.i.d. because \( E \{ x(t) \} \) is function of \( t \).

(1) Not Ergodic in mean

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

(2) Not Ergodic in \( \mathbb{R}(t) \)

\[ \frac{1}{T} \int x(t+2) x(t) dt = 0 \text{ for any cos} \]