

Problem 2.2

(c)

$$\begin{aligned}
 E\{\hat{\mu}[P]\} &= E\left\{\frac{1}{P} \cdot \sum_{n=0}^{P-1} x[n]\right\} = E\left\{\frac{1}{P} \cdot [x[0] + x[1] + \dots + x[P-1]]\right\} \\
 &= \frac{1}{P} \cdot [E\{x[0]\} + E\{x[1]\} + \dots + E\{x[P-1]\}] = \\
 &= \frac{1}{P} \cdot \sum_{n=0}^{P-1} E\{x[n]\} = \frac{1}{P} \cdot \sum_{n=0}^{P-1} \mu_x = \frac{1}{P} \cdot P \cdot \mu_x \\
 &= \underline{\underline{\mu_x}}
 \end{aligned}$$

$$\begin{aligned}
 E\{\hat{r}_{xy}[k, P]\} &= E\left\{\frac{1}{P} \cdot \sum_{n=0}^{P-1} x[n+k] \cdot y[n]\right\} = \\
 &= \frac{1}{P} \cdot \sum_{n=0}^{P-1} E\{x[n+k] \cdot y[n]\} = \\
 &= \frac{1}{P} \cdot \sum_{n=0}^{P-1} r_{xy}[k] = \frac{1}{P} \cdot P \cdot r_{xy}[k] \\
 &= \underline{\underline{r_{xy}[k]}}
 \end{aligned}$$