Q1. $E(\tilde{p}) = E\left(\frac{X+3}{n+4}\right) = \frac{E(X)}{n+4} + \frac{3}{n+4} = \frac{\mu+3}{n+4} \neq \frac{\mu}{n}$

Hence, it is a biased estimator of the binomial parameter p.

$$B_n(\tilde{p}, p) = \frac{\mu+3}{n+4} - \frac{\mu}{n} = \frac{3}{n+4} - \frac{4\mu}{n(n+4)}$$

$$\lim_{n\to\infty} B_n(\tilde{p}, p) = \lim_{n\to\infty}\left(\frac{3}{n+4} - \frac{4\mu}{n(n+4)}\right) = 0$$

Hence we say that it is a asymptotically unbiased estimator

Q2. $$\frac{d \ln f_X(x,\theta)}{d\theta} = \frac{d}{d\theta}\left(-\ln\theta - \frac{x}{\theta}\right) = -\frac{1}{\theta} + \frac{x}{\theta^2}$$

$$\frac{d^2}{d\theta^2} \ln f_X(x,\theta) = \frac{1}{\theta^2} - \frac{2x}{\theta^3}.$$

Hence $$CRLB = -\frac{1}{n E\left[\frac{d^2}{d\theta^2} \ln f_X(x,\theta)\right]} = \frac{1}{\frac{2nE[X]}{\theta^3} - \frac{n}{\theta^2}}$$

Since $E[X] = \theta$

$$CRLB = \frac{\theta^2}{n}$$