1. $\because \mu_k = \frac{1}{k}\sum_{i=1}^{k} X_i$ and $\mu_k = \mu_{k-1} + \frac{1}{k}(X_k - \mu_{k-1})$

$\because b_{k+1} = b_k + \alpha_{k}(X_k - \mu_k)$, $k \in [0, 9999]$ $k \in N$

$\therefore b_n = \frac{1}{n}\sum_{i=1}^{n} X_i$, $X_i \sim N(b, \sigma^2)$

$\therefore$ by LLT, $\lim E[b_n] = \lim E[\frac{1}{n}\sum_{i=1}^{n} X_i] = \lim \frac{1}{n} E[\sum_{i=1}^{n} X_i] = b$

2. $\because \lim E[|b_n - b|^2] = \lim E[b_n^2 - 2 \cdot b \cdot b_n + b^2]$

$= \lim \frac{1}{n^2}(\sum_{i=1}^{n} E[X_i^2] + \sum_{i \neq j} E[X_i] \cdot E[X_j]) - b^2$

$= \lim \frac{\sigma^2}{n} = 0$

Identity MRP with CFD in the form of

$$V(x) = \gamma \{ c^h(x) + \sum_{i=1}^{d} p^h(x+he_i|x) V(x+he_i) + p^h(x-he_i|x) V(x-he_i) \}$$

① $V(x) = \gamma \cdot c^h(x) + \gamma \cdot \sum_{i=1}^{2} p^h(x+he_i|x) V(x+he_i) + p^h(x-he_i|x) V(x-he_i)$

$\because \gamma = \frac{2}{2+h^2}$, $c^h(x) = \frac{h^2}{2}[(x_1-\frac{1}{2})^2 + (x_2-\frac{1}{2})^2 - 2]$, $p^h(x \pm he_i|x) = \frac{1}{4}$

$\therefore$ We can get the conclusion