Which of the following linear Gaussian POMP model have an observable variable Y_n with distribution matching an ARMA(1,1) model? Here, ϵ_n and η_n are Gaussian white noise. X_n is 1-dimensional in (1) and 2-dimensional in (2) and (3).

(A) Only (3)
(B) (1) and (2) but not (3)
(C) (2) and (3) but not (1)
(D) (1) and (3) but not (2)
(E) (1), (2) and (3)

$$\left.\begin{array}{rcl} X_n &=& aX_{n-1}+\epsilon_n \\ Y_n &=& X_n+\eta_n \end{array}\right\} \tag{1}$$

$$\left.\begin{array}{rcl} X_n &=& \begin{pmatrix} a & 1 \\ 0 & 0 \end{pmatrix} X_{n-1} + \begin{pmatrix} 0 \\ 1 \end{pmatrix} \epsilon_n \\ Y_n &=& (1,0)\, X_n + \eta_n \end{array}\right\} \tag{2}$$

$$\left.\begin{array}{rcl} X_n &=& \begin{pmatrix} a & 1 \\ 0 & 0 \end{pmatrix} X_{n-1} + \begin{pmatrix} 1 \\ b \end{pmatrix} \epsilon_n \\ Y_n &=& (1,0)\, X_n \end{array}\right\} \tag{3}$$