✗

i) Gaussian: $\begin{bmatrix} y^{(pr)} \\ z^{(pr)} \\ x^{(pr)} \end{bmatrix}$

$\Rightarrow \xi = \sim \begin{bmatrix} \mu_p \\ v_r \\ y^{(pr)} + z^{(pr)} \end{bmatrix}$

$\underbrace{}_{\mu_p + v_r}$

$Cov(y, z) = 0 \quad (indep.)$

$Cov(x, x) = Var(\mu \, y^{(pr)} + z^{(pr)} + \varepsilon^{(pr)})$
$\qquad = \sigma_p^2 + T_r^2 + \sigma^2$
$\qquad \quad (all \; indep)$

$Cov(x, y) = Cov(y + z + \varepsilon, y)$
$\qquad = \sigma_p^2$

$Cov(x, z) = Cov(y + z + \varepsilon, z)$
$\qquad = T_r^2$

$\Rightarrow \Sigma = \begin{matrix} \\ y \\ z \\ x \end{matrix} \overset{\begin{matrix} y & z & x \end{matrix}}{\begin{bmatrix} \sigma_p^2 & 0 & \vdots & \sigma_p^2 \\ 0 & T_r^2 & \vdots & T_r^2 \\ \hline \sigma_p^2 & T_r^2 & \vdots & \sigma_p^2 + T_r^2 + \sigma^2 \end{bmatrix}}$