Se sec 2.21

Following (2.1) → (2.4) gives

$$A = \begin{bmatrix} 0 & 1 \\ -\omega^2 & 0 \end{bmatrix}, \quad B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$D = \begin{bmatrix} \omega\cos(\varphi) & \sin(\varphi) \end{bmatrix}$$

<u>Proof</u>

$$\dot{x}_1 = x_2 \quad \Rightarrow \quad sX_1 = X_2$$

$$\dot{x}_2 = -\omega^2 x_1 + u \quad \Rightarrow \quad s^2 X_1 + \omega^2 X_1 = u \quad \Rightarrow \quad X_1 = \underline{\underline{\frac{u}{s^2+\omega^2}}}$$

and

$$y = \omega\cos(\varphi) X_1 + \sin(\varphi) X_2$$

$$= (\omega\cos(\varphi) + s\sin(\varphi)) X_1 = \frac{s\sin(\varphi) + \omega\cos(\varphi)}{s^2+\omega^2} u$$

Transfer function from table

$$\boxed{h_p(s) = \frac{s\sin(\varphi) + \omega\cos(\varphi)}{s^2+\omega^2}}$$