ECE 201 D3

$$\frac{d^2f}{dt} + g\cdot\frac{df}{dt} + h\cdot f(t) = a\cos(\omega t) + b\sin(\omega t)$$

$$f_p(t) = A\cos(\omega t) + B\sin(\omega t)$$
$$f_p'(t) = -A\omega\sin(\omega t) + B\omega\cos(\omega t)$$
$$f_p''(t) = -A\omega^2\cos(\omega t) - B\omega^2\sin(\omega t)$$

$$-A\omega^2\cos(\omega t) - B\omega^2\sin(\omega t) + g(-A\omega\sin(\omega t) + B\omega\cos(\omega t)) + h(A\cos(\omega t) + B\sin(\omega t)) = a\cos(\omega t) + b\sin(\omega t)$$

$$-A\omega^2 + gB\omega + hA = a$$
$$\therefore a = (h-\omega^2)A + gB\omega$$

$$-B\omega^2 - gA\omega + hB = b$$
$$\therefore b = (h-\omega^2)B - gA\omega$$

$$\therefore \begin{bmatrix} (h-\omega^2) & g\omega \\ -g\omega & (h-\omega^2) \end{bmatrix}\begin{bmatrix} A \\ B \end{bmatrix} = \begin{bmatrix} a \\ b \end{bmatrix}$$

let $A = \begin{bmatrix} h-\omega^2 & g\omega \\ -g\omega & h-\omega^2 \end{bmatrix}$, $X = \begin{bmatrix} A \\ B \end{bmatrix}$ and $B = \begin{bmatrix} a \\ b \end{bmatrix}$

$$\therefore AX = B$$
$$\therefore X = A^{-1}\cdot B$$