(1)(6)

2. PARTIAL FRACTIONAL EXPANSION

$G(\Omega,\theta)$ WITH SIMPLE POLES

$$G(\Omega,\theta) = \sum_{\substack{r=-p \\ r\neq 0}}^{p} \frac{L_r}{\Omega-\lambda_r} + \sum_{r=1}^{q} \frac{S_r}{\Omega-\sigma_r}$$

COMPL. CONJ. POLES — REAL POLES

$\overline{L_r} = L_{-r}$

$\lambda_{-r} = \overline{\lambda_r}$

$\underline{\theta} = [\sigma_1 \cdots \sigma_q \; Re(\lambda_1) \; Im(\lambda_1) \cdots S_1 \cdots S_q \; Re(L_1) \; Im(L_1) \cdots]$

$n_a = 2p + q$

- HIGH n — STARTING VALUES OF INSUFFICIENT QUALITY
  POOR ESTIMATES (LOCAL MINIMA)

3. FACTORIZATION

$$G(\Omega,\theta) = \frac{\prod_{r=1}^{n_b}(\Omega-\zeta_r)}{\prod_{r=1}^{n_a}(\Omega-\lambda_r)}$$

ZEROS

POLES

- STARTING VALUES FROM RATIONAL FORM
- ILL CONDITIONED NORMAL EQUATION, IF MULTIPLE P/Z

4. ORTOGONAL POLYNOMIALS

$$G(\Omega,\theta) = \frac{B(\Omega,\theta)}{A(\Omega,\theta)} = \frac{\sum_{r=0}^{n_q} b_r q_r(\Omega)}{\sum_{r=0}^{n_p} a_r p_r(\Omega)}$$

PARAMETERS DEFINING rth POLYNOMIAL

- GOOD FOR ORDERS $n > 30$
- CHOSEN TO MAX NUMERICAL STABILITY
  MINIMAL CONDITION NUMBER IN NORMAL EQUATION

$n_p = n_a$

$n_q = n_b$

5. STATE-SPACE MODEL

$$\dot{x}(t) = A x(t) + B u(t)$$
$$y(t) = C x(t) + D u(t)$$

$n_a \geq n_b$

~~PROPER SYSTEM~~

$$x(t+1) = A x(t) + B u(t)$$
$$\cancel{y(t) = C x(t) + D u(t)}$$

$$G(s,\theta) = C(sI_{n_a} - A)^{-1} B + D$$

— ASSUMING ZERO INITIAL CONDITIONS

$$G(z^{-1},\theta) = z^{-1} C (I_{n_a} - z^{-1} A)^{-1} B + D$$