Pb (28)

SOLUTION

$$3s^7+9s^6+6s^5+4s^4+7s^3+8s^2+2s+6=0$$

s^7	3	6	7	2
s^6	9	4	8	6
s^5	4.66	4.33	0	
s^4	-4.36	8	6	
s^3	12.88	6.42		
s^2	10.17	6		
s^1	-1.18			
s^0	6			

Four sign changes . . ∴ Four roots in RHSP.

Remaining three roots in LHSP.

Pb (29) For the transfer function given by

$$\frac{C(s)}{R(s)} = \frac{20}{(s^8+s^7+12s^6+22s^5+39s^4+59s^3+48s^2+38s+20)}$$

find the number of poles in RHSP, LHSP and on the jw axis.

Pb (29)

SOLUTION

$$s^8+s^7+12s^6+22s^5+39s^4+59s^3+48s^2+38s+20=0$$

s^8	1	12	39	48	20
s^7	1	22	59	38	
s^6	-10	-20	10	20	
s^5	20	60	40		
A(s) → s^4	10	30	20		
s^3	0 (40)	0 (60)			
s^2	15	20			
s^1	6.67				
s^0	20				

$$A(s) = 10s^4+30s^2+20$$

$$= \underline{40}s^3+\underline{60}s$$

Interpretation of the Routh's array

- For the even polynomial $10s^4 + 30s^2 + 20$, no sign change exists from the s^4 row down to the s^0 row.
- Since there are no RHSP poles, no LHSP poles are present because of the requirement for symmetry.
- Hence the even polynomial must have all four of its poles on the jw axis.
- The remaining roots of the total (complete) polynomial are evaluated from the s^8 row down to the s^4 row.
- There are two sign changes, so two roots in RHSP.
- So the remaining two roots are in the LHSP.
- Number of poles in RHSP = 2
  LHSP = 2
  jw axis = 4