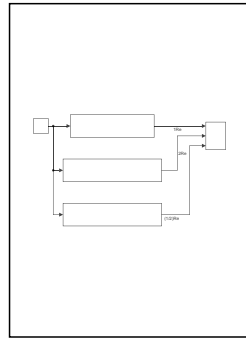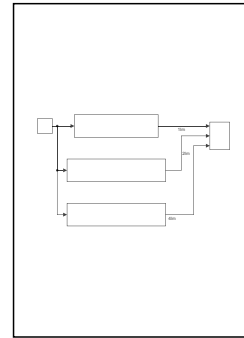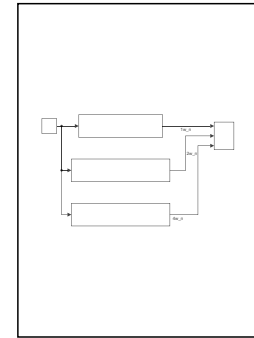Part I: Exercise 1
First-Order Systems



Part I: Exercise 2
Variable Real Part of Roots
in Second-Order Systems



Part I: Exercise 3
Variable Imaginary Part of Roots
in Second-Order Systems



Part I: Exercise 4
Variable Natural Frequencies
in Second-Order Systems
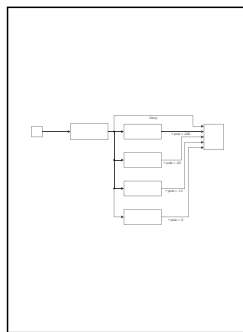


Part III: Exercise 1
Added Poles
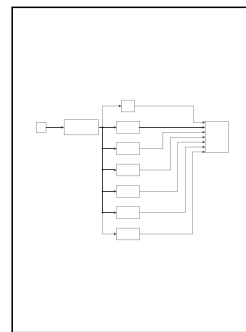


Part III: Exercise 2
Added Zeros
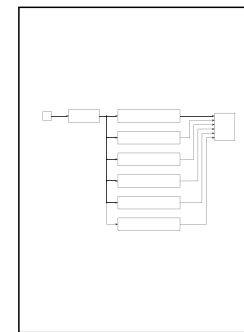


Part III: Exercise 3
Parametric Transfer
Function I
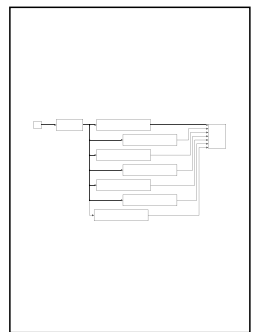


Part III: Exercise 4
Parametric Transfer
Function II

$$\frac{1}{s+1}$$

$$\frac{2}{s+2}$$

$$\frac{3}{s+3}$$

$$\frac{4}{s+4}$$

a=1

a=2

a=3

a=4

$$\frac{b}{s^2 + a \cdot s + b}$$

1Re

$$\frac{G\_b(2,2)}{s^2 + G\_a(2,2) \cdot s + G\_b(2,2)}$$

2Re

$$\frac{G\_b(2,3)}{s^2 + G\_a(2,3) \cdot s + G\_b(2,3)}$$

(1/2)Re

$$\frac{b}{s^2 + a \cdot s + b}$$

1lm

$$\frac{G\_b(3,2)}{s^2 + G\_a(3,2) \cdot s + G\_b(3,2)}$$

2lm

$$\frac{G\_b(3,3)}{s^2 + G\_a(3,3) \cdot s + G\_b(3,3)}$$

4lm

$$\frac{b}{s^2 + a \cdot s + b}$$

1w_n

$$\frac{G\_b(4,2)}{s^2 + G\_a(4,2) \cdot s + G\_b(4,2)}$$

2w_n

$$\frac{G\_b(4,3)}{s^2 + G\_a(4,3) \cdot s + G\_b(4,3)}$$

4w_n

G4(s)

$$\frac{25}{s^2 + 4s + 25}$$

$$\frac{1}{(s + 200)}$$ + pole = -200

$$\frac{1}{(s + 20)}$$ + pole = -20

$$\frac{1}{(s + 10)}$$ + pole = -10

$$\frac{1}{(s + 5)}$$ + pole = -5

$$\frac{1}{s}$$

G4(s)

$$\frac{25s}{s^2 + 4s + 25}$$

$$\frac{(s + 200)}{s}$$

+ zero = -200

$$\frac{(s + 50)}{s}$$

+ zero = -50

$$\frac{(s + 20)}{s}$$

+ zero = -20

$$\frac{(s + 10)}{s}$$

+ zero = -10

$$\frac{(s + 5)}{s}$$

+ zero = -5

$$\frac{(s + 2)}{s}$$

+ zero = -2

$$\frac{25}{s^2 + 4s + 25}$$

G4(s) GCF

$$G_b(7,1)/G_a(7,1) \cdot \frac{(s + G\_a(7,1))}{(s + G\_b(7,1))}$$

G41(s)

$$G_b(7,2)/G_a(7,2) \cdot \frac{(s + G\_a(7,2))}{(s + G\_b(7,2))}$$

G42(s)

$$G_b(7,3)/G_a(7,3) \cdot \frac{(s + G\_a(7,3))}{(s + G\_b(7,3))}$$

G43(s)

$$G_b(7,4)/G_a(7,4) \cdot \frac{(s + G\_a(7,4))}{(s + G\_b(7,4))}$$

G44(s)

$$G_b(7,5)/G_a(7,5) \cdot \frac{(s + G\_a(7,5))}{(s + G\_b(7,5))}$$

G45(s)

$$G_b(7,6)/G_a(7,6) \cdot \frac{(s + G\_a(7,6))}{(s + G\_b(7,6))}$$

G46(s)