CHAPTER

6.6

DESIGN OF CONTROL SYSTEMS

1. The term 'reset control' refers to

(A) Integral control (B) Derivative control

(C) Proportional control (D) None of the above

2. If stability error for step input and speed of response be the criteria for design, the suitable controller will be

(A) P controller (B) PI controller

(C) PD controller (D) PID controller

3. The transfer function $\frac{1+0.5s}{1+s}$ represent a

(A) Lag network

(B) Lead network

(C) Lag–lead network

(D) Proportional controller

4. A lag compensation network

(a) increases the gain of the original network without affecting stability.

(b) reduces the steady state error.

(c) reduces the speed of response

(d) permits the increase of gain of phase margin is acceptable.

In the above statements, which are correct

(A) a and b (B) b and c

(C) b, c, and d (D) all

5. Derivative control

(A) has the same effect as output rate control

(B) reduces damping

(C) is predictive in nature

(D) increases the order of the system

6. Consider the List I and List II

List I	List II
P. Derivative control	1. Improved overshoot response
Q. Integral control	2. Less steady state errors
R. Rate feed back control	3. Less stable
S. Proportional control	4. More damping

The correct match is

	P	Q	R	S
(A)	1	2	3	4
(B)	4	3	1	2
(C)	2	3	1	4
(D)	1	2	4	3

7. Consider the List–I (Transfer function) and List–II (Controller)

List I	List II
P.	1. P–controller
Q.	2. PI–controller
R. $\frac{K_1 s + K_2}{K_3 s}$	3. PD–controller
S. $\frac{K_1}{K_2 s}$	4. PID–controller

The correct match is

	P	Q	R	S
(A)	3	4	2	1
(B)	4	3	1	2
(C)	3	2	1	4
(D)	4	1	2	3

8. The transfer function of a compensating network is of form $(1+\alpha Ts)/(1+Ts)$. If this is a phase–Lag network, the value of α should be

(A) greater than 1

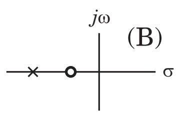
(B) between 0 and 1

(C) exactly equal to 1

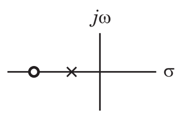
(D) exactly equal to 0

9. The poll–zero configuration of a phase–lead compensator is given by

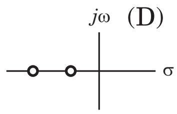
(A)



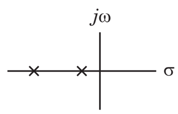
(B)



(C)



(D)



10. While designing controller, the advantage of pole–zero cancellation is

(A) The system order is increased

(B) The system order is reduced

(C) The cost of controller becomes low

(D) System's error reduced to optimum levels

11. A proportional controller leads to

(A) infinite error for step input for type 1 system

(B) finite error for step input for type 1 system

(C) zero steady state error for step input for type 1 system

(D) zero steady state error for step input for type 0 system

12. The transfer function of a phase compensator is given by $(1+aTs)/(1+Ts)$ where $a>1$ and $T>0$. The maximum phase shift provided by a such compensator is

(A) $\tan^{-1}\left(\frac{a+1}{a-1}\right)$

(B) $\sin^{-1}\left(\frac{a-1}{a+1}\right)$

(C) $\tan^{-1}\left(\frac{a-1}{a+1}\right)$

(D) $\cos^{-1}\left(\frac{a-1}{a+1}\right)$

13. For an electrically heated temperature controlled liquid heater, the best controller is

(A) Single–position controller

(B) Two–position controller

(C) Floating controller

(D) Proportional–position controller

14. In case of phase–lag compensation used is system, gain crossover frequency, band width and undamped frequency are respectively

(A) decreased, decreased, decreased

(B) increased, increased, increased

(C) increased, increased, decreased

(D) increased, decreased, decreased

15. A process with open–loop model

$$G(s)=\frac{Ke^{-s\,T_D}}{\tau s+1}$$

is controlled by a PID controller. For this purpose

(A) the derivative mode improves transient performance

(B) the derivative mode improves steady state performance

(C) the integral mode improves transient performance

(D) the integral mode improves steady state performance.

The correct statements are

(A) (a) and (c)

(B) (b) and (c)

(C) (a) and (d)

(D) (b) and (d)

16. A lead compensating network

(a) improves response time

(b) stabilizes the system with low phase margin

(c) enables moderate increase in gain without affecting stability.

(d) increases resonant frequency

In the above statements, correct are

(A) (a) and (b)

(B) (a) and (c)

(C) (a), (c) and (d)

(D) All

17. A Lag network for compensation normally consists of

(A) R, L and C elements

(B) R and L elements

(C) R and C elements

(D) R only

18. The pole–zero plot given in fig.P6.6.18 is that of a

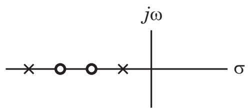


Fig. P6.6.18

(A) PID controller

(B) PD controller

(C) Integrator

(D) Lag–lead compensating network

19. The correct sequence of steps needed to improve system stability is

(A) reduce gain, use negative feedback, insert derivative action

(B) reduce gain, insert derivative action, use negative feedback

(C) insert derivative action, use negative feedback, reduce gain

(D) use negative feedback, reduce gain, insert derivative action.

20. In a derivative error compensation

(A) damping decreases and setting time decreases

(B) damping increases and setting time increases

(C) damping decreases and setting time increases

(D) damping increases and setting time decreases

21. An ON–OFF controller is a

(A) P controller

(B) PID controller

(C) integral controller

(D) non linear controller

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SOLUTIONS

1. (A)	2. (D)	3. (A)	4. (D)	5. (B)
6. (D)	7. (A)	8. (B)	9. (A)	10. (B)
11. (C)	12. (B)	13. (C)	14. (D)	15. (C)
16. (D)	17. (C)	18. (D)	19. (D)	20. (D)
21. (D)				