Design and Compensation of Control Systems

Objective Type Questions:

(i)Which one of the following statements is true?

Phase lead net work is used

    (a) when fast transient response is desired.
    (b) when error constants are specified
    (c) when system bandwidth is to be decreased.

    Ans: (a)

(ii) Which one of the following statements is not true?

    (a)The phase lead network increases the phase margin of the system and thus provides additional stability

    (b)When the design specifications include an error constant, the design of a phase lead network is more readily accomplished on the Bode diagram.

    (c) When an error constant is not specified but the settling time and overshoot for a step input are specified, the design of a phase lead network is more readily carried out on the s-plane.

    (d) Phase lead compensation decreases the system bandwidth, whereas the phase lag compensation increases the system bandwidth.

    Ans: (d)

(iii) Which one of the following compensators is used to increase the damping of a pair of complex roots that are severely underdamped:

       (a) phase-lag
       (b) phase-lead
       (c) phase lag-lead
       (d) any one of the above

   Ans: (b)

       (iv) The time domain method of compensation uses the following performance specifications:

         (a) Steady-state error coefficients, phase margin and crossover frequency
         (b) Steady-state error coefficients, location of closed loop dominant poles, and root sensitivity
         (c) Integral squared error

     Ans: (c)

(v) The time domain method of compensation uses the following performance specifications:

         (a) Integral squared error
         (b) Steady-state error coefficients, phase margin and crossover frequency
         (c) Steady-state error coefficients, location of closed loop dominant poles, and root sensitivity

Ans: (a)

(vi) It is desirable to avoid the use of the differentiator in control system design, because

    (a) it is not economical
   (b) its size is big
   (c) it develops noise and will saturate the amplifier

 Ans: (c)

(vii) In practise, inductance is not fabricated to realize a lag network.

       (a) True
       (b) False.

Ans: (a)

(viii) The following compensator increases the damping of a pair of complex roots that are severely under-damped.

(a) phase-lag
(b) phase-lead
(c) phase-lag-lead
(d) none of the above.

Ans: (d)

(ix) The following performance specifications are used in the time domain method of compensation.

(a) Integral squared error
(b) Steady-state error coefficients, phase margin and crossover frequency
(c) Steady-state error coefficients, location of closed loop dominant poles, and root sensitivity
(d) Desired closed-loop transfer function, and sensitivity of poles to parameter variations.
(e)

Ans : (a)

(x)Which one of the following statements is not rue?
(a) A phase-lag compensation network decreases the system bandwidth and slows down the transient response.
(b) A phase-lag network reduces the steady-state error and suppresses high frequency noise.
(c) A phase-lead network increases the bandwidth and is used to obtain fast transient response.
(d) A phase-lead network decreases the bandwidth and slows down the transient response.

Ans: (d)

(xi) Match List E containing A,B,C time functions with List F containing Laplace transforms in the following Table.

List E	List F
A	$x(t)= 1-e^{-at}$
I	$x(s)= \omega/[(s+a)^2+\omega^2]$
B	$x(t)= e^{-at} \sin\omega t$
II	$\omega n^2/(s^2 + 2\xi\omega n\, s+ \omega n^2)$
C	$x(t)= \omega_n\, e^{-j\omega n\, t}\sin\omega_n \sqrt{(1-\xi^2)}.t / \sqrt{(1-\xi^2)}.\;$; $\xi<1$

III	$x(s)=a/(s(s+a))$

The correct matching is
(a) AIII BII CI
(b)AI BI ICIII
(c) AIII BI CII
(d)AI BIICIII

Ans: (c)

(xii)Match List E with List F given below.

	List E		List F
A	Analogue controller	I	Are high performance controllers and are combinations of analogue & digital controllers.
B	Digital controller	II	Represent the variables in the equations by continuous physical quantities and can be designed that will serve as nondecision making controllers
C	Hybrid controller	III	Operate only on numbers and are currently being used for the solution of optimal operation of industrial plants.

The correct matching is

(a)AII BIII CI
(b) AI BII CIII
(c) AIII BII CI
(d)AI BIII CII

Ans (a)

(xiii) A phase lead compensating network

    (a) decreases the system bandwidth
    (b) speeds up dynamic response
    (c) reduces the steady-state error

(d) slows down transient response.

Ans: (b)

(xiv)   A phase lag compensating network
a.   decreases the system bandwidth
b. increases susceptibility to noise
c. increases gain at higher frequencies
d. is not applicable when phase decreases rapidly near the crossover frequency.

Ans: (a)