Control Systems Questions and Answers – Steady State Error

This set of Control Systems Multiple Choice Questions & Answers (MCQs) focuses on “Steady State Error”.

1. The steady state error for a unity feedback system for the input r(t) to the system G(s) = K(s+2)/s(^{3}+7s^2+12s) is 6R/K. The input r (t) is _____
a) Rt2/2
b) Rt3/2
c) Rt5/2
d) Rt7/2

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Answer: a
Explanation: Ka = 2K/12 = K/6. Ess = 6R/K. So, as we take Rt$^{2/2}$ we get 6R/K as the error. The other options can’t be true because the input is exceeding the desired input. It is inversely proportional to the gain.

2. The ramp input is applied to a unity feedback system with type number 1 and zero frequency 20. What is the steady state error?
a) 1%
b) 2%
c) 5%
d) 9%

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Answer: c
Explanation: Steady state error is the error calculated between the final output and desired output and the error must be less and this steady state error is inversely proportional to gain. Here unity feedback system is given with zero frequency 20 so we take 1/20th part and the answer comes as 5%.

3. A unit integrator is applied to a modified system along with a ramp input. The modified value of the steady state error is 0.25. What was the initial value?
a) 0.05
b) 0.1
c) 0.15
d) 0.2

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Answer: d
Explanation: The integrator is similar to the phase lag systems and it is used to reduce or eliminate the steady state error and when it is cascaded with the ramp input. We know that when unit integrator is applied with a ramp input the steady state error will automatically increase but here we wanted the initial value which will be obviously less than the modified steady state error and by the same proportion.

4. Systems of type higher than 1 are not employed in practice.
a) True
b) False

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Answer: b
Explanation: Systems of type higher than 2 are not employed in practice as they’re difficult to stabilize and dynamic error increases. Systems of type 2 or lower are already stable and has less dynamic error.

5. The initial response when output is not equal to input is _____
a) Error response
b) Transient response
c) Dynamic response
d) Static response

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Answer: b
Explanation: The response is not long last lasting and real, so it is a transient response. It can’t be a static or dynamic response as the output doesn’t match the input and also there’s no chance of error response.

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6. The steady state error for a unit step input is _____
a) 1/kp
b) 1/(1-kp)
c) 1/2kp
d) 1/(1+kp)

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Answer: d
Explanation: R(s) =1/s for unit step and for the transfer function whose limit tends to zero, it is 1/1+kp. We use Laplace and Inverse Laplace Transform to calculate the same.

7. For a unity feedback system, the open loop transfer function is G(s) = K(s+2)/s^2 (s^2+7s+12). What is the type of system?
a) One
b) Two
c) Three
d) Four

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Answer: b
Explanation: As in the numerator it is mentioned K(s+2) so we got two poles in the open loop transfer function at the origin. For a given transfer function we calculate poles and zeros and the number of poles determine the type of the system.

8. The For a unity feedback system the open loop transfer function is G(s) = K(s+2)/s^2 (s^2+7s+12). What is the value of Ka?
a) 12/k
b) k/12
c) k/6
d) 6/k

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Answer: c
Explanation: As limit s tends to zero : s^{2}G(s) = K(s+2)/ (s^2+7s+12) = k/6. Ka is the acceleration error constant which is calculated by the above method.

9. For a system whose transfer function is G(s) =10/s (1+s), what are the dynamic error coefficients k2 & k3 respectively as k1 is infinity?
a) 11, 10.1
b) 10.1, 11
c) 10, 11.1
d) 9, 10.1

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Answer: c
Explanation: We should compare it with E(s)/R(s) = 1/k1+1/k2s+1/k3s^2. G(s) = 10/s(1+s) is compared with the above equation which is the parent equation for calculating dynamic error constants where k1 comes as infinity and K2, K3 takes the value of 10 & 11.1 respectively.

10. The Laplace transform of a parabolic signal is _____
a) 1
b) A/s^3
c) A/s^2
d) A/s

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Answer: a
Explanation: As u(t) is a unity step function r(t)=0;t<0 and r(t)=1; t>0. The parabolic signal is a signal which has varying amplitudes and when we take Laplace Transform of that we get 1 as the answer.

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