

Kode Soal: B

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[9.8.9] Given a feedback system where  $H_1(s) = 1/(s+1)$  in the forward path and  $H_2(s) = 2$  in the feedback path, and the feedback signal is subtracted from the input. What is the overall system function  $H(s) = Y(s)/X(s)$ ?

- A.  $\frac{1}{s+3}$
- B.  $\frac{1}{s-1}$
- C.  $\frac{2}{s+1}$
- D.  $\frac{s+1}{s+3}$

[9.2.4] If  $x(t)$  is a left-sided signal, and its Laplace transform converges, what is the nature of its Region of Convergence (ROC)?

- A. A right-half plane,  $\text{Re}\{s\} > \sigma_0$
- B. A left-half plane,  $\text{Re}\{s\} < \sigma_0$
- C. A strip parallel to the  $j\omega$ -axis
- D. The entire  $s$ -plane

[9.3.1] What is the basic equation for the inverse Laplace transform  $x(t)$ ?

- A.  $x(t) = \frac{1}{2\pi j} \int_{-\infty}^{+\infty} X(s)e^{st} ds$
- B.  $x(t) = \frac{1}{2\pi j} \int_{\sigma-j\infty}^{\sigma+j\infty} X(s)e^{st} ds$
- C.  $x(t) = \int_{-\infty}^{+\infty} X(s)e^{st} ds$
- D.  $x(t) = \frac{1}{2\pi} \int_{-\infty}^{+\infty} X(s)e^{j\omega t} d\omega$

[9.8.3] For a feedback interconnection where the output of  $H_2(s)$  is subtracted from the input  $X(s)$  before entering  $H_1(s)$ , what is the overall system function  $H(s) = Y(s)/X(s)$ ?

- A.  $H(s) = H_1(s) + H_2(s)$
- B.  $H(s) = H_1(s)H_2(s)$
- C.  $H(s) = \frac{H_1(s)}{1-H_1(s)H_2(s)}$
- D.  $H(s) = \frac{H_1(s)}{1+H_1(s)H_2(s)}$

[9.1.13] In a rational Laplace transform  $X(s) = N(s)/D(s)$ , what are the roots of the denominator polynomial  $D(s)$  called?

- A. Poles of  $X(s)$
- B. Zeros of  $X(s)$
- C. Critical points
- D. Eigenvalues

[9.1.4] If the complex variable  $s$  is purely imaginary ( $s = j\omega$ ), what does the Laplace transform  $X(s)$  become?

- A. The inverse Fourier transform of  $x(t)$
- B. The Fourier transform of  $x(t)$
- C. The convolution of  $x(t)$
- D. The Z-transform of  $x(t)$

[9.3.7] Given  $X(s) = \frac{1}{(s+1)(s+2)}$  with ROC  $\text{Re}\{s\} > -1$ , what is the partial-fraction coefficient  $A$  for the term  $\frac{A}{s+1}$ ?

- A. -1
- B. 1
- C. 2
- D. -2

[9.1.1] What is the general term for the integral  $H(s) = \int_{-\infty}^{\infty} h(t)e^{-st} dt$ ?

- A. Fourier Transform
- B. Convolution Integral
- C. Laplace Transform
- D. Z-Transform

[9.1.16] How are zeros typically marked on an s-plane plot?

- A. With a circle (o)
- B. With a star (\*)
- C. With an x (x)
- D. With a square ( )

[9.1.7] For the signal  $x(t) = e^{-at}u(t)$ , under what condition does its Laplace transform converge?

- A.  $\text{Re}\{s\} < a$
- B.  $\text{Re}\{s\} > -a$
- C.  $\text{Re}\{s\} = 0$
- D.  $\text{Re}\{s\} < -a$

[9.5.2] If  $x(t) \leftrightarrow X(s)$  with ROC  $R$ , what is the Laplace transform of  $x(t-t_0)$ ?

- A.  $e^{st_0}X(s)$
- B.  $e^{-st_0}X(s)$
- C.  $X(s-t_0)$
- D.  $X(s+t_0)$

[9.1.10] On the s-plane, which axis represents the real part of  $s$ ?

- A. The  $j\omega$ -axis
- B. The  $t$ -axis
- C. The  $\sigma$ -axis
- D. The  $z$ -axis

- [9.2.7] For a rational Laplace transform  $X(s)$  corresponding to a left-sided signal  $x(t)$ , the ROC is the region in the  $s$ -plane:
- To the left of the leftmost pole.
  - To the right of the rightmost pole.
  - Between the leftmost and rightmost poles.
  - The entire  $s$ -plane.
- C. The left-half plane.  
D. The right-half plane.
- [9.5.5] If  $x_1(t) \leftrightarrow X_1(s)$  and  $x_2(t) \leftrightarrow X_2(s)$ , what is the Laplace transform of their convolution  $x_1(t) * x_2(t)$ ?
- $X_1(s) + X_2(s)$
  - $X_1(s)/X_2(s)$
  - $X_1(s)X_2(s)$
  - $sX_1(s)X_2(s)$
- [9.1.19] For the Laplace transform in Example 9.5,  $X(s) = \frac{(s-1)^2}{(s+1)(s-2)}$ , does the Fourier transform of the corresponding  $x(t)$  converge?
- Yes, because the ROC includes the  $j\omega$ -axis.
  - No, because the ROC does not include the  $j\omega$ -axis.
  - It depends on the value of  $s$ .
  - Only for specific values of  $t$ .
- [9.7.2] What is the common term used for  $H(s)$  in the context of Laplace transforms for LTI systems?
- Frequency response
  - Transfer function
  - Impulse response
  - Step response
- [9.3.4] If the Region of Convergence (ROC) for a rational Laplace transform  $X(s)$  is to the right of the rightmost pole, what type of signal is  $x(t)$ ?
- Left-sided
  - Two-sided
  - Right-sided
  - Finite duration
- [9.3.10] If the ROC of  $X(s)$  is  $\text{Re}\{s\} > -1$ , does the Laplace transform of  $x(t)$  exist?
- Yes
  - No
  - Only if  $X(s)$  is non-rational
  - Only if  $x(t)$  is a finite duration signal
- [9.2.3] Can the Region of Convergence (ROC) for a rational Laplace transform contain any poles?
- Yes, always
  - No, because  $X(s)$  is infinite at poles
  - Only if the signal is finite duration
  - Only if the signal is right-sided
- [9.7.5] An LTI system is stable if and only if the ROC of its system function  $H(s)$  includes which part of the  $s$ -plane?
- The entire real axis.
  - The entire imaginary axis ( $j\omega$ -axis).
- [9.7.8] If an LTI system is characterized by a linear constant-coefficient differential equation, what can be generally said about its system function  $H(s)$ ?
- It is always an exponential function.
  - It is always a rational function of  $s$ .
  - It is always a polynomial in  $s$ .
  - It is always a constant.
- [9.7.11] An LTI system is known to be causal and has poles at  $s = -3$  and  $s = 2$ . Is this system stable?
- Yes, because it is causal.
  - No, because it has a pole in the right-half plane.
  - Yes, because its poles are real.
  - Insufficient information to determine stability.
- [9.8.6] If a system function  $H(s)$  is expressed as a sum of simpler system functions using partial-fraction expansion, which block diagram representation is suggested?
- Direct form
  - Parallel form
  - Cascade form
  - Series form