Eksamen i TDAT3024

Oppgave nr: 1 Kandidat nr: 10013

Antall sider: 7 Side: 1 Dato: 7.12.20

Denne kolonne er forbeholdt sensor

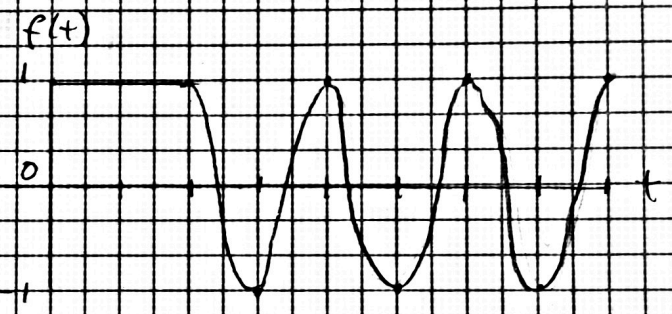
1 a)

$f(t) = f_1(t) + u(t-a_1)(f_2(t) - f_1(t))$
$+ u(t-a_2)$, $a_1 = a_2 = 2$,
$f_1 = 1$, $f_2 = \cos(3t-6)$

$f(t) = 1 + u(t-2)(\cos(3t-6) - 1)$

$f(t) = 1 + u(t-2) \cdot \cos(3t-6) - u(t-2)$

1 b)



1 c) $\mathcal{L}(f(t))$

$= \mathcal{L}(1) + \mathcal{L}(u(t-2)\cos(3t-6))$
$+ \mathcal{L}(-u(t-2))$

$= \frac{1}{s} + \mathcal{L}(u(t-a)\cos(\omega(t-a))$, $a = 2$, $\omega = 3$
$+ \mathcal{L}(-u(t-a))$, $a = 2$

$= \frac{1}{s} + \frac{s}{s^2+9} \cdot e^{-2s} - \frac{1}{s} e^{-2s}$

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Oppgave nr: 1 Kandidat nr: 10013

Antall sider: 7 Side: 2 Dato: 7.12.20

Denne kolonne er forbeholdt sensor

1d) $y'' - 7y' + 10y = f(t)$, $y(0) = -3$, $y'(0) = -15$

$y'' + ay' + by = f(t)$

bruker:

$(s^2 + (-7)s + 10)Y - sy(0) - y'(0) - (-7) = F(s)$

setter inn startbetingelser:

$$Y = \frac{F(s) + 3s - 15 - 7}{(s^2 - 7s + 10)}$$

$$Y = \frac{F(t)}{s^2 - 7s + 10} + \frac{3s}{s^2 - 7s + 10} - \frac{22}{s^2 - 7s + 10}$$

$$Y = \frac{F(t)}{(s-2)(s-5)} + \frac{3s}{(s-2)(s-5)} - \frac{22}{(s-2)(s-5)}$$

$$Y = \frac{F(t)}{(s-2)(s-5)} +$$

Eksamen i TDAT3024

Oppgave nr: 1 Kandidat nr: 10013

Antall sider: 7 Side: 3 Dato: 7.12.20

Denne kolonne er forbeholdt sensor

1e)

$1 = A(s-2)(s-5) + B(s)(s-5) + C(s)(s-2)$

$s=2: 1 = B \cdot -6 \Rightarrow \underline{\underline{B = -\frac{1}{6}}}$

$s=5: 1 = C \cdot 15 \Rightarrow \underline{\underline{C = \frac{1}{15}}}$

$s=0: 1 = A \cdot 10 \Rightarrow \underline{\underline{A = \frac{1}{10}}}$

Eksamen i TDAT3024

Oppgave nr: 1 Kandidat nr: 10013

Antall sider: 7 Side: 4 Dato:

Denne kolonne er forbeholdt sensor

1e)

$$\frac{s}{(s^2+9)(s-2)(s-5)} = \frac{3L+4s}{s^2+9} + \frac{M}{s-2} + \frac{N}{s-5}$$

$$s = (3L+4s)(s-2)(s-5) + M(s^2+9)(s-5) + N(s^2+9)(s-2)$$

$$s=5: 5 = N(102) \Rightarrow \underline{\underline{N = 5/102}}$$

$$s=2: 2 = M(-39) \Rightarrow \underline{\underline{M = 2/-39}}$$

$$s=0: 0 = (3L+0)(-2)(-5) + M(-45) + N(-18)$$

$$\Rightarrow -10L = \frac{2}{-39}(-45) + \frac{5}{102}(-18)$$

$$\Rightarrow -10L = \frac{315}{221} \Rightarrow \underline{\underline{L = -\frac{63}{221}}}$$

Eksamen i TDAT3024

Oppgave nr: 2b Kandidat nr: 10013

Antall sider: 7 Side: 5 Dato: 7.12.20

Denne kolonne er forbeholdt sensor

2b)

$w_{1,0} = -2$

$w_{2,0} = 0$

$w_{3,0} = 1$

$w_{4,0} = -1$

$w_{1,1} = -2 \times h_1(0, 1, -2) =$

Eksamen i TDAT3024

Oppgave nr: 3 Kandidat nr: 10013

Antall sider: 7 Side: 6 Dato: 7.12.20

Denne kolonne er forbeholdt sensor

3 a) $D_f = [0, 6]$

$[0, 6] = [0, L] \Rightarrow L = 6 \Rightarrow L/2 = 3$

Sjekker $f(L - x) = f(x) \; \forall x \in [0, L]$

$x = 0 \Rightarrow 0 = 6$

$x = 1 \Rightarrow 2 = 2$

$x = 2 \Rightarrow 4 = 4$

$x = 3 \Rightarrow 6 = 6$

$x = 4 \Rightarrow 8 = 8$

$x = 5 \Rightarrow 10 = 10$

$x = 6 \Rightarrow 12 = 12$

funksjonen er symmetrisk om $x = 3$

Eksamen i TDAT3024

Oppgave nr: 3 Kandidat nr: 10013

Antall sider: 7 Side: 7 Dato:

Denne kolonne er forbeholdt sensor

3b)

$$b_n = \begin{cases} 0 & \text{for jevn } n \\ \frac{4}{L}\int_0^{L/2} f(x)\sin\frac{n\pi x}{L}\,dx & \text{for odde } n \end{cases}$$

$$\Rightarrow 1 \cdot \int_0^2 3x \sin\left(\frac{n\pi x}{4}\right) dx$$

$$\frac{12}{n\pi}\left[\frac{4}{n\pi}\sin\left(\frac{n\pi x}{4}\right) - x\cos\left(\frac{n\pi x}{4}\right)\right]_0^2$$

$$\frac{12}{n\pi}\left(\frac{4}{n\pi}\sin\left(\frac{n\pi}{2}\right) - 2\cos\left(\frac{n\pi}{2}\right) - 0 - 0\right)$$

$$b_n = \frac{12}{n\pi}\left(\frac{4}{n\pi}\sin\left(\frac{n\pi}{2}\right) - 2\cos\left(\frac{n\pi}{2}\right)\right)$$

Stemmer med fasit:

$$b_9 = \frac{16}{27\pi^2}$$

Eksamen i TDAT3024

Oppgave nr: 3 Kandidat nr: 10613

Antall sider: 7 Side: 7 Dato: 7.12.20

Denne kolonne er forbeholdt sensor

3b)

$$b_n = \begin{cases} 0 & \text{for jevn } n \\ \frac{4}{L}\int_0^{L/2} f(x)\sin\frac{n\pi x}{L}\,dx & \text{for odde } n \end{cases}$$

$$\Rightarrow 1 \cdot \int_0^2 3x \sin\left(\frac{n\pi x}{4}\right) dx$$

$$\frac{12}{n\pi}\left[\frac{4}{n\pi}\sin\left(\frac{n\pi x}{4}\right) - x\cos\left(\frac{n\pi x}{4}\right)\right]_0^2$$

$$\frac{12}{n\pi}\left(\frac{4}{n\pi}\sin\left(\frac{n\pi}{2}\right) - 2\cos\left(\frac{n\pi}{2}\right) - 0 - 0\right)$$

$$b_n = \frac{12}{n\pi}\left(\frac{4}{n\pi}\sin\left(\frac{n\pi}{2}\right) - 2\cos\left(\frac{n\pi}{2}\right)\right)$$

stemmer med fasit:

$$b_9 = \frac{16}{27\pi^2}$$

Eksamen i TDAT3024

Oppgave nr: 2 Kandidat nr: 10013

Antall sider: Side: Dato: 7.12.20

Denne kolonne er forbeholdt sensor

2 a)

$z_2' = z_1^2 + z_3' + 3$

$z_4' = z_2 - z_1 z_3 + 2$

$z_1(0) = -2$, $z_2(0) = 0$, $z_3(0) = 1$, $z_4(0) = -1$

$z_1' = z_2$

$z_2' = z_1^2 + z_3' + 3$

$z_3' = z_2' - z_1^2 - 3$

$z_4' = z_2 - z_1 z_3 + 2$