1. $S_1[u(n)] = 3u(n) + 5$ $\boxed{A}$

$S_2[u(t)] = \sin(\pi t)\, u(t)$

a) $S(\alpha u_1(n) + \beta u_2(n)) = \alpha S[u_1(n)] + \beta S[u_2(n)]$, $\forall \alpha, \beta \in \mathbb{R}$

$S[\alpha u_1(t) + \beta u_2(t)] = \alpha S[u_1(t)] + \beta S[u_2(t)]$

b) $u_1(n) \to y_1(n) = 3u_1(n) + 5 \to \alpha y_1(n) = 3\alpha u_1(n) + 5\alpha$

$u_2(n) \to y_2(n) = 3u_2(n) + 5 \to \beta y_2(n) = 3\beta u_2(n) + 3\beta$

$\to y_3(n) = \alpha y_1(n) + \beta y_2(n) = 3\alpha u_1(n) + 3\beta u_2(n) + 5\alpha + 3\beta$

$u(n) = \alpha u_1(n) + \beta u_2(n) \to y(n) = 3\alpha u_1(n) + 3\beta u_2(n) + 5$

$y_3(n) \neq y(n)$ NIJE LINEARAN

c) $u_1(t) \to y_1(t) = \sin \pi t\, u_1(t) \to \alpha y_1(t) = \alpha \sin \pi t\, u_1(t)$

$u_2(t) \to y_2(t) = \sin \pi t\, u_2(t) \to \beta y_2(t) = \beta \sin \pi t\, u_2(t)$

$y_3(t) = \alpha y_1(t) + \beta y_2(t) = \alpha \sin \pi t\, u_1(t) + \beta \sin \pi t\, u_2(t)$

$u(t) = \alpha u_1(t) + \beta u_2(t) \to y(t) = \sin(\pi t) \cdot (\alpha u_1(t) + \beta u_2(t))$

$y_3(t) = y(t)$ SUSTAV JE LINEARAN

d) $u(n) \to u_1(n) = u(n-N) \to y_1(n) = 3u_1(n) + 5$

$= 3u(n-N) + 5$

$u(n) \to y(n) = 3u(n) + 5 \to y(n-N) = 3u(n-N) + 5$

$y_1(n) = y(n-N)$ SUSTAV JE VREMENSKI STALAN

e) $u(t) \to u_1(t) = u(t-T) \to y_1(t) = \sin(\pi t)\, u_1(t)$

$= \sin(\pi t)\, u(t-T)$

$u(t) \to y(t) = \sin(\pi t) u(t) \to y(t-T) = \sin(\pi(t-T))\, u(t-T)$

$y_1(t) \neq y(t-T)$ SUSTAV JE VREMENSKI PROMJENJIV.

A

2. $y(n) - \frac{3}{4} y(n-1) = u(n)$

$u(n) = \left(\frac{3}{2}\right)^n \mu(n)$

a) $q - \frac{3}{4} = 0$

$q = \frac{3}{4}$

$y(n) = u(n) + \frac{3}{4} h(n-1)$

$y(0) = \delta(0) = 1$

$h(n) = C \left(\frac{3}{4}\right)^n$

$h(0) = C = 1$

$$\boxed{h(n) = \left(\frac{3}{4}\right)^n \mu(n)}$$

b) $u(n) = \left(\frac{3}{2}\right)^n \mu(n)$

$$y(n) = \sum_{m=-\infty}^{\infty} h(n-m) u(m) = \sum_{m=-\infty}^{\infty} \left(\frac{3}{4}\right)^{n-m} \mu(n-m) \left(\frac{3}{2}\right)^m \mu(m)$$

$$= \sum_{m=0}^{n} \left(\frac{3}{4}\right)^{n-m} \left(\frac{3}{2}\right)^m = \left(\frac{3}{4}\right)^n \sum_{m=0}^{n} \left(\frac{4}{3}\frac{3}{2}\right)^m = \left(\frac{3}{4}\right)^n \sum_{m=0}^{n} 2^m$$

$$= \left(\frac{3}{4}\right)^n \frac{1-2^{n+1}}{1-2} = \left(\frac{3}{4}\right)^n (2^{n+1} - 1) = \left(\frac{3}{2^2}\right)^n (2^{n+1} - 1)$$

$$\boxed{y(n) = 2\left(\frac{3}{2}\right)^n - \left(\frac{3}{4}\right)^n}$$

c) $y_h(n) = C \left(\frac{3}{4}\right)^n$

$y_p(n) = K \left(\frac{3}{2}\right)^n$

$K \left(\frac{3}{2}\right)^n - \frac{3}{4} K \left(\frac{3}{2}\right)^{n-1} = \left(\frac{3}{2}\right)^n$

$\frac{3}{2} K - \frac{3}{4} K = \frac{3}{2}$

$K = 2$

$y_p(n) = 2 \left(\frac{3}{2}\right)^n$

$y(n) = u(n) + \frac{3}{4} y(n-1)$

$y(0) = u(0) + \frac{3}{4} y(-1) = 1$

TOTAL

$y(n) = C\left(\frac{3}{4}\right)^n + 2\left(\frac{3}{2}\right)^n$

$y(0) = C + 2 = 1$

$C = -1$

$$\boxed{y(n) = \left[-\left(\frac{3}{4}\right)^n + 2\left(\frac{3}{2}\right)^n\right] \mu(n)}$$

3. $y''(t) + 12y'(t) + 45y(t) = u'(t)$ **A**

$u(t) = 48\cos(15t)\mu(t)$

$y(0^-) = y'(0^-) = 0$

a) $s^2Y(s) + 12sY(s) + 45Y(s) = sU(s)$

$H(s) = \dfrac{Y(s)}{U(s)} = \dfrac{s}{s^2+12s+45}$

b) nule $n_1 = 0$, $n_2 = \infty$

poloi $s^2 + 12s + 45 = 0$

$s_{1,2} = \dfrac{-12 \pm \sqrt{144 - 4\cdot 45}}{2} = \dfrac{-12 \pm \sqrt{-36}}{2} = -6 \pm 3j$

c) Kriterij unutrašnje stabilnosti sustava:

asimptotski stabilan sustav ako je $Re\{s_i\} < 0$, $\forall_i$

stabilan - marginalno stabilan ako je $Re\{s_i\} \leq 0$, $\forall_i$

nestabilan - ako postoji $Re\{s_i\} > 0$

d) $\left.\begin{matrix} Re\{s_1\} < 0 \\ Re\{s_2\} < 0 \end{matrix}\right\}$ stabilan sustav

e) $Y(s) = H(s)\cdot U(s)$

$u(t) = 48\cos(15t)\mu(t) \rightarrow U(s) = 48\dfrac{s}{s^2+15^2}$

$Y(s) = \dfrac{s}{s^2+12s+45}\cdot\dfrac{48s}{s^2+15^2} = \dfrac{As+B}{s^2+12s+45} + \dfrac{Cs+D}{s^2+225}$

$As^3 + 225As + Bs^2 + 225B + Cs^3 + C\cdot 12s^2 + 45Cs + Ds^2 + 12Ds + 45D = 48s$

$A + C = 0 \rightarrow A = -C$

$B + 12C + D = 48 \rightarrow B + 12C - 5B = 48 \rightarrow -4B + 12C = 48 \rightarrow -B + 3C = 12$

$225A + 45C + 12D = 0 \rightarrow -225C + 45C + 12D = 0 \rightarrow -180C + 12D = 0$

$225B + 45D = 0 \rightarrow 5B + D = 0$

$D = -5B$

$-15C + D = 0$

$-15C - 5B = 0$

$3C + B = 0$

$6C = 12$

$C = 2$

$A = -2$

$B = -3C = -6$

$D = 30$

$Y(s) = \dfrac{-2s-6}{s^2+12s+45} + \dfrac{2s+30}{s^2+225}$

$= -2\dfrac{s+6-3}{(s+6)^2+9} + 2\dfrac{s+15}{s^2+225}$

$= -2\dfrac{s+6}{(s+6)^2+9} + 2\dfrac{3}{(s+6)^2+9} + 2\dfrac{s}{s^2+225} + 2\dfrac{15}{s^2+225}$

$$\boxed{y(t) = \left(-2e^{-6t}\cos(3t) + 2e^{-6t}\sin 3t + 2\cos 15t + 2\sin 15t\right)\mu(t)}$$

4. $$y(n)+\frac{3}{5}y(n-1)+\frac{2}{25}y(n-2)=u(n)+u(n-1)$$ $\boxed{A}$

$$u(n)=\{\underline{5},2,5,2,\dots\}$$
$$y(-1)=\frac{5}{2}$$
$$y(-2)=-\frac{25}{4}$$

a) $$Y(z)+\frac{3}{5}z^{-1}Y(z)+\frac{2}{25}z^{-2}Y(z)=U(z)+z^{-1}U(z)$$

$$H(z)=\frac{Y(z)}{U(z)}=\frac{1+z^{-1}}{1+\frac{3}{2}z^{-1}+\frac{2}{25}z^{-2}}=\frac{z^2+z}{z^2+\frac{3}{5}z+\frac{2}{25}}=\frac{z(z+1)}{(z+\frac{2}{5})(z+\frac{1}{5})}$$

b) $$H(e^{i\Omega})=\frac{1+e^{-i\Omega}}{1+\frac{3}{2}e^{-i\Omega}+\frac{2}{25}e^{-2i\Omega}}$$

c) $$u(n)=\{5,2,5,2,\dots\}$$
$$U(z)=5+2z^{-1}+5z^{-2}+2z^{-3}+\dots$$
$$=5(1+z^{-2}+z^{-4}+\dots)+2z^{-1}(1+z^{-2}+z^{-4}+\dots)$$
$$=(5+2z^{-1})(1+z^{-2}+z^{-4}+\dots)$$
$$=(5+2z^{-1})\cdot\sum_{n=0}^{\infty}(z^{-2})^n=(5+2z^{-1})\cdot\frac{1}{1-z^{-2}}=\frac{5z+2}{z}\cdot\frac{z^2}{z^2-1}$$

$$\boxed{U(z)=\frac{5z(z+\frac{2}{5})}{(z-1)(z+1)}}$$

d) $$Y(z)+\frac{3}{5}z^{-1}Y(z)+\frac{3}{5}y(-1)+\frac{2}{25}Y(z)z^{-2}+\frac{2}{25}z^{-1}y(-1)+\frac{2}{25}y(-2)$$
$$=U(z)+z^{-1}U(z)+\cancel{u(-1)}$$

$$Y(z)\left(1+\frac{3}{5}z^{-1}+\frac{2}{25}z^{2}\right)=U(z)\left(1+z^{-1}\right)-\frac{3}{5}y(-1)-\frac{2}{25}z^{-1}y(-1)-\frac{2}{25}y(-2)$$

$$Y(z)=\frac{1+z^{-1}}{1+\frac{3}{5}z^{-1}+\frac{2}{25}z^{-2}}\cdot U(z)-\frac{z\cancel{(z+\frac{1}{5})}}{(z+\frac{2}{5})\cancel{(z+\frac{1}{5})}}$$
$$=\frac{\cancel{(z+1)}z}{\cancel{(z+\frac{2}{5})}(z+\frac{1}{5})}\cdot\frac{5z\cancel{(z+\frac{2}{5})}}{(z-1)\cancel{(z+1)}}-\frac{z}{z+\frac{2}{5}}$$

$$\frac{5z}{(z+\frac{1}{5})(z-1)}=\frac{A}{z+\frac{1}{5}}+\frac{B}{z-1}\rightarrow\begin{array}{l}A=\frac{5}{6}\\B=\frac{25}{6}\end{array}$$

$$Y(z)=\frac{5}{6}\frac{z}{z+\frac{1}{5}}+\frac{25}{6}\frac{z}{z-1}-\frac{z}{z+\frac{2}{5}}$$

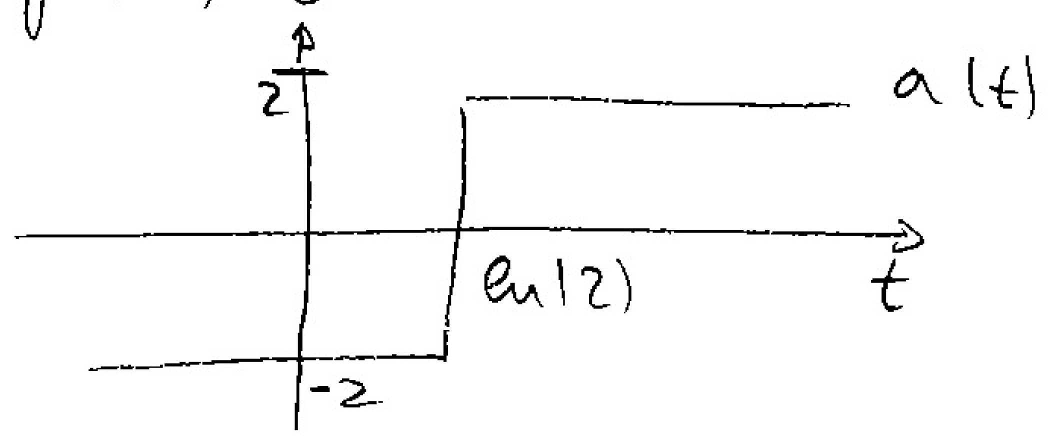
$$\boxed{y(n)=\left[\frac{5}{6}\left(-\frac{1}{5}\right)^n-\left(-\frac{2}{5}\right)^n+\frac{25}{6}\right]\mu(n)}$$

5. $y'(t) + a(t)\,y(t) = 8u(t) - u'(t)$

A

$u(t) = \mu(t)$

$y(0^-) = 0$



$y(0^+) - y(0^-) = -u(0^+)$

$y(0^+) = -1$

a) za $t > 0$ i $t < \ln(2)$

$$y'(t) - 2y(t) = -u'(t) + 8u(t)$$
$$= -\delta(t) + 8\mu(t)$$

$$y'(t) - 2y(t) = 8\mu(t)$$

homogeno

$s = 2$

$y_h(t) = Ce^{2t}$

partikularno

$y_p(t) = K$

$-2K = 8$

$K = -4$

totalni

$y_t(t) = Ce^{2t} - 4$

$y_t(0^+) = C - 4 = -1$

$C = -1 + 4 = 3$

$\boxed{y_t(t) = 3e^{2t} - 4}$

na kraju intervala

$\boxed{y_t(\ln(2)) = 3e^{2\ln 2} - 4 = 12 - 4 = 8}$

za $t \geq \ln(2)$

$$y'(t) + 2y(t) = 8\mu(t)$$

$s = -2$

homogeno

$y_h(t) = Ce^{-2t}$

partikularno

$y_p(t) = K$

$2K = 8$

$K = 4$

$y_p(t) = 4$

totalni

$y_t(t) = Ce^{-2t} + 4$

$y_t(\ln(2)) = Ce^{-2\ln 2} + 4$

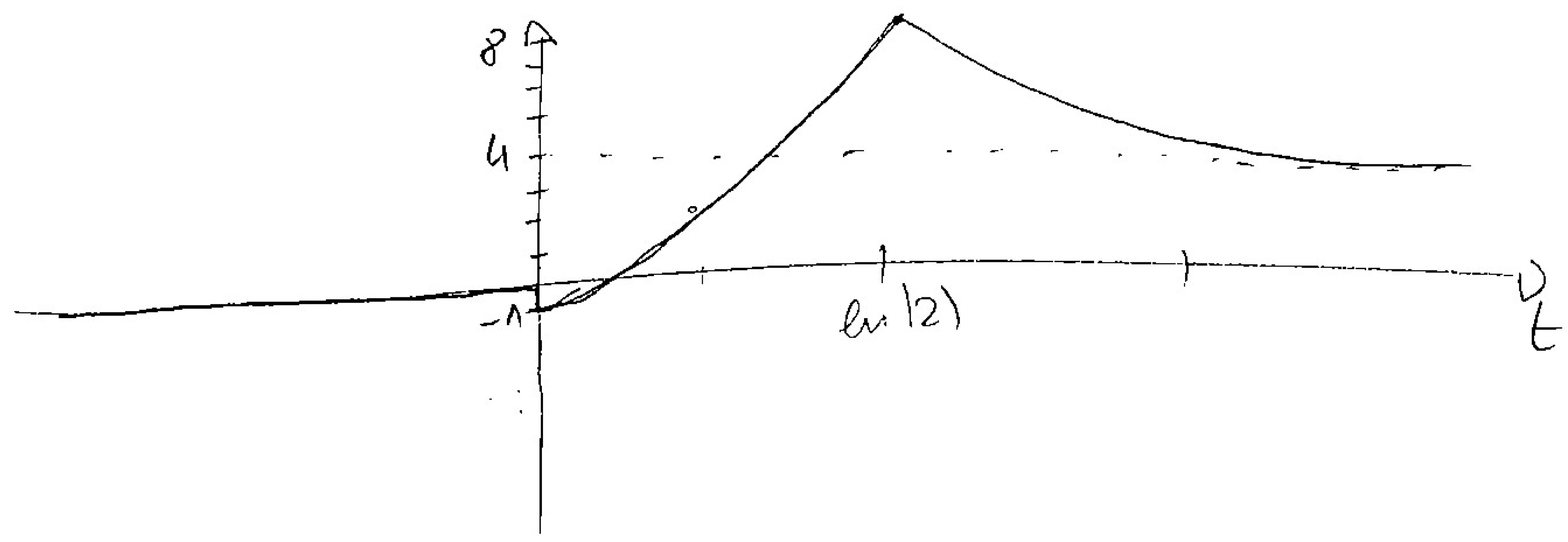
$= C(-2) + 4 = 8$

$-2C = 8 - 4 = 4$

$C = -2$

$\boxed{y_t(t) = -2e^{-2t} + 4}$

b)



1. $S_1\{u\}(n) = 5u(n) + 3$ (B)

$S_2\{u\}(t) = \cos(\pi t)\, u(t)$

a) $S\{\alpha u_1(n) + \beta u_2(n)\} = \alpha S\{u_1(n)\} + \beta S\{u_2(n)\}$, $\forall \alpha, \beta \in R$

$S\{\alpha u_1(t) + \beta u_2(t)\} = \alpha S\{u_1(t)\} + \beta S\{u_2(t)\}$

b) $u_1(n) \to y_1(n) = 5u_1(n) + 3 \to \alpha y_1 = 5\alpha u_1(n) + 3\alpha$

$u_2(n) \to y_2(n) = 5u_2(n) + 3 \to \beta y_2(n) = 5\beta u_2(n) + 3\beta$

$y_3(n) = \alpha y_1(n) + \beta y_2(n) = 5\alpha u_1(n) + 3\alpha + 5\beta u_2(n) + 3\beta$

$= 5\alpha u_1(n) + 5\beta u_2(n) + 3(\alpha + \beta)$

$u(n) = \alpha u_1(n) + \beta u_2(n) \to y(n) = 5(\alpha u_1(n) + 5\beta u_2(n)) + 3$

$y_3(n) \neq y(n)$ SUSTAV NIJE LINEARAN

c) $u_1(t) \to y_1(t) = \cos(\pi t)\, u_1(t) \to \alpha y_1(t) = \alpha \cos(\pi t)\, u_1(t)$

$u_2(t) \to y_2(t) = \cos(\pi t)\, u_2(t) \to \beta y_2(t) = \beta \cos(\pi t)\, u_2(t)$

$y_3(t) = \alpha y_1(t) + \beta y_2(t) = \alpha \cos(\pi t)\, u_1(t) + \beta \cos(\pi t)\, u_2(t)$

$u(t) = \alpha u_1(t) + \beta u_2(t) \to y(t) = \cos \pi t \cdot (\alpha u_1(t) + \beta u_2(t))$

$y_3(t) = y(t)$ SUSTAV JE LINEARAN

d) $u(n) \to u_1(n) = u(n-N) \to y_1(n) = 5u_1(n) + 3 = 5u(n-N) + 3$

$u(n) \to y(n) = 5u(n) + 3 \to y(n-N) = 5u(n-N) + 3$

$y_1(n) = y(n-N)$ SUSTAV JE VREMENSKI STALAN

e) $u(t) \to u_1(t) = u(t-T) \to y_1(t) = \cos(\pi t)\, u_1(t)$

$= \cos(\pi t)\, u(t-T)$

$u(t) \to y(t) = \cos(\pi t)\, u(t) \to y(t-T) = \cos(\pi(t-T))\, u(t-T)$

$y_1(t) \neq y(t-T)$ SUSTAV JE VREMENSKI PROMJENJIV

2. $y(n) - \frac{2}{5} y(n-1) = u(n)$

$u(n) = \left(\frac{4}{5}\right)^n \mu(n)$

B

a) $q - \frac{2}{5} = 0$

$q = \frac{2}{5}$

$h(n) = C\left(\frac{2}{5}\right)^n$

$h(n) = \delta(n) + \frac{2}{5} h(n-1)$

$h(0) = 1$

$h(0) = C = 1$

$$\boxed{h(n) = \left(\frac{2}{5}\right)^n \mu(n)}$$

b) $u(n) = \left(\frac{4}{5}\right)^n \mu(n)$

$$y(n) = \sum_{m=-\infty}^{\infty} h(n-m)\, u(m) = \sum_{m=-\infty}^{\infty} \left(\frac{2}{5}\right)^{n-m} \mu(n-m) \left(\frac{4}{5}\right)^m \mu(m)$$

$$= \sum_{m=0}^{n} \left(\frac{2}{5}\right)^{n-m} \left(\frac{4}{5}\right)^m = \left(\frac{2}{5}\right)^n \sum_{m=0}^{n} \left(\frac{5}{2} \cdot \frac{4}{5}\right)^m = \left(\frac{2}{5}\right)^n \sum_{m=0}^{n} 2^m$$

$$= \left(\frac{2}{5}\right)^n \frac{1 - 2^{n+1}}{1-2} = \left(\frac{2}{5}\right)^n \left(2^{n+1} - 1\right) = \boxed{-\left(\frac{2}{5}\right)^n + 2\left(\frac{4}{5}\right)^n}$$

c) $y_h(n) = C\left(\frac{2}{5}\right)^n$

$y_p(n) = K\left(\frac{4}{5}\right)^n$

$K\left(\frac{4}{5}\right)^n - \frac{2}{5} K \left(\frac{4}{5}\right)^{n-1} = \left(\frac{4}{5}\right)^n$

$\frac{4}{5} K - \frac{2}{5} K = \frac{4}{5}$

$\frac{2}{5} K = \frac{4}{5}$

$K = 2$

$y_p(n) = 2\left(\frac{4}{5}\right)^n$

TOTALNI

$y(n) = u(n) + \frac{2}{5} y(n-1)$

$y(-1) = 0 \rightarrow y(0) = 1$

$y(n) = C\left(\frac{2}{5}\right)^n + 2\left(\frac{4}{5}\right)^n$

$y(0) = C + 2 = 1$

$C = -1$

$$\boxed{y(n) = \left[-\left(\frac{2}{5}\right)^n + 2\left(\frac{4}{5}\right)^n\right] y(n)}$$

3. $y''(t)+8y'(t)+20y(t)=u'(t)$ (B)

$u(t)=32\cos(10t)\,\mu(t)$

$y(0^-)=y'(0^-)=0$

a) $s^2Y(s)+8sY(s)+20Y(s)=sU(s)$

$$H(s)=\frac{Y(s)}{U(s)}=\frac{s}{s^2+8s+20}$$

b) NULA $n_1=0,\ n_2=\infty$

POLOVI $s^2+8s+30=0$

$$s_{1,2}=\frac{-8\pm\sqrt{64-80}}{2}=-4\pm 2j$$

c) Kriterij unutrašnje stabilnosti

asimptotski stabilan sustav ako je $Re\{s_i\}<0,\ \forall i$

stabilan (marginalno stabilan) ako je $Re\{s_i\}\leq 0,\ \forall i$

nestabilan - ako postoji $Re\{s_i\}>0$

d) $\left.\begin{array}{l} Re\{s_1\}<0 \\ Re\{s_2\}<0 \end{array}\right\}$ stabilan sustav

e) $u(t)=32\cos(10t)\,\mu(t) \rightarrow U(s)=32\frac{s}{s^2+100}$

$$Y(s)=H(s)\cdot U(s)=\frac{s}{s^2+8s+20}\cdot\frac{32s}{s^2+100}=\frac{As+B}{s^2+8s+20}+\frac{Cs+D}{s^2+100}$$

$$As^3+100As+Bs^2+100B+Cs^3+8Cs^2+20Cs+Ds^2+8Ds+20D=32s^2$$

$A+C=0 \rightarrow A=-C$

$B+8C+D=32 \rightarrow B+8C-5B=32 \rightarrow -4B+8C=32 \rightarrow -B+2C=8$

$100A+20C+8D=0 \rightarrow -100C+20C+8D=0 \rightarrow -80C-40B=0 \rightarrow 2C+B=0$

$100B+20D=0 \rightarrow 5B+D=0 \rightarrow D=-5B$

$4C=8$

$C=2$ $\quad A=-2$

$D=20$ $\quad B=-2C$, $B=-4$

$$Y(s)=\frac{-2s-4}{s^2+8s+20}+\frac{2s+20}{s^2+100}$$

$$=-2\frac{s+4-2}{(s+4)^2+4}+2\frac{s+10}{s^2+100}=$$

$$=-2\frac{s+4}{(s+4)^2+4}+2\frac{2}{(s+4)^2+4}+2\frac{s}{s^2+100}+2\frac{10}{s^2+100}$$

$$\boxed{y(t)=\left(-2\cdot e^{-4t}\cos 2t+2e^{-4t}\sin 2t+2\cos 10t+2\sin 10t\right)\mu(t)}$$

4. $y(n) + \frac{11}{14} y(n-1) + \frac{1}{7} y(n-2) = u(n) + u(n-1)$ $\boxed{B}$

$u(n) = \{\underline{7}, 2, 7, 2, \dots\}$

$y(-1) = \frac{7}{2}$

$y(-2) = -\frac{49}{4}$

a) $y(z) + \frac{11}{14} z^{-1} y(z) + \frac{1}{7} z^{-2} y(z) = U(z) + z^{-1} U(z)$

$$H(z) = \frac{y(z)}{U(z)} = \frac{1 + z^{-1}}{1 + \frac{11}{14} z^{-1} + \frac{1}{7} z^{-2}} = \frac{z(z+1)}{z^2 + \frac{11}{14} z + \frac{1}{7}}$$

b) $$H(e^{i\Omega}) = \frac{1 + e^{-i\Omega}}{1 + \frac{11}{14} e^{-i\Omega} + \frac{1}{7} e^{-2i\Omega}}$$

c) $u(n) = \{\underline{7}, 2, 7, 2, \dots\}$

$$U(z) = 7 + 2z^{-1} + 7z^{-2} + 2z^{-3} + \dots$$

$$= 7(1 + z^{-2} + z^{-4} + \dots) + 2z^{-1}(1 + z^{-2} + z^{-4} + \dots)$$

$$= (7 + 2z^{-1})(1 + z^{-2} + z^{-4} + \dots) = (7 + 2z^{-1}) \cdot \sum_{n=0}^{\infty} (z^{-2})^n$$

$$= (7 + 2z^{-1}) \frac{1}{1 - z^{-2}} = \frac{z(7z+2)}{z^2 - 1} = \frac{7z(z + \frac{2}{7})}{z^2 - 1}$$

d) $y(z) + \frac{11}{14} z^{-1} y(z) + \frac{11}{14} y(-1) + \frac{1}{7} z^{-2} y(z) + \frac{1}{7} z^{-1} y(-1) + \frac{1}{7} y(-2)$

$= U(z) + z^{-1} U(z) + \cancel{u(-1)}$

$y(z)(1 + \frac{11}{14} z^{-1} + \frac{1}{7} z^{-2}) = U(z)(1 + z^{-1}) - \frac{11}{14} y(-1) - \frac{1}{7} y(-2) - \frac{1}{7} z^{-1} y(-1)$

$$y(z) = \frac{1 + z^{-1}}{1 + \frac{11}{14} z^{-1} + \frac{1}{7} z^{-2}} \cdot \frac{7z(z + \frac{2}{7})}{z^2 - 1} - \frac{z + \frac{1}{2}}{(z + \frac{2}{7})(z + \frac{1}{2})}$$

$$= \frac{z\cancel{(z+1)}}{z^2 + \frac{11}{14} z + \frac{1}{7}} \frac{7z(z + \frac{2}{7})}{(z-1)\cancel{(z+1)}} - \frac{1}{(z + \frac{2}{7})}$$

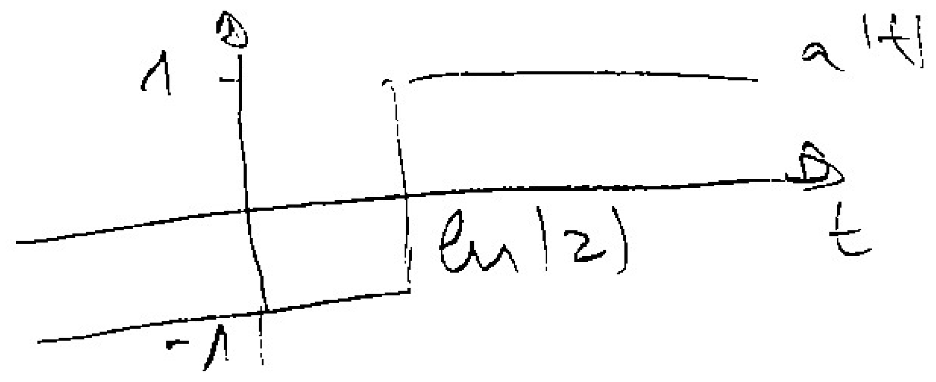
$$= \frac{7z^2 \cancel{(z + \frac{2}{7})}}{\cancel{(z + \frac{2}{7})}(z + \frac{1}{2})(z-1)} - \frac{1}{z + \frac{2}{7}}$$

$$\frac{7z}{(z + \frac{1}{2})(z - 1)} = \frac{A}{z-1} + \frac{B}{z + \frac{1}{2}} = \frac{14}{3} \frac{1}{z-1} + \frac{7}{3} \frac{1}{z + \frac{1}{2}}$$

$$y(z) = \frac{14}{3} \frac{z}{z-1} + \frac{7}{3} \frac{z}{z + \frac{1}{2}} - \frac{1}{z + \frac{2}{7}}$$

$$\boxed{y(n) = \left[\frac{14}{3} + \frac{7}{3} \left(-\frac{1}{2}\right)^n - \left(-\frac{2}{7}\right)^n\right] \mu(n)}$$

5. $y'(t) + a(t)\,y(t) = -u'(t) + 2u(t)$ **B**



$u(t) = \mu(t)$ $\quad y(0^-) = 0$

POČETNI UVJET

$y(0^+) - y(0^-) = -u(0^+)$

$y(0^+) = -2 + 0 = -1$

za $t > 0$ i $t \leq \ln(2) \to a(t) = -1$

$y'(t) - y(t) = -u'(t) + 2u(t)$

$y'(t) - y(t) = -\delta(t) + 2\mu(t)$

HOMOGENA

$s - 1 = 0 \quad y_h(t) = Ce^{t}$

$s = 1$

IMPULSNI

$h_1(t) = Ce^{t}$

$h_1(0^+) = C = 1$

$h_1(t) = e^{t}$

$h(t) = -e^{t}$

PARTIKULARNO

$y_p(t) = K$

$-K = 2$

$K = -2$

$y_p(t) = -2$

TOTALNI

$y(t) = Ce^{t} - e^{t} - 2$

$y(0^+) = C - 1 - 2 = C - 3 = -1$

$C = 2$

$\boxed{y(t) = e^{t} - 2}$

$\boxed{y(\ln(2)) = 2 - 2 = 0}$

za $t > \ln(2) \to a(t) = 1$

$y'(t) + y(t) = 2\mu(t)$

$y'(t) + y(t) = 2\mu(t) \to$ za $t > \ln(2)$ nema više impulsa

HOMOGENA

$s + 1 = 0 \quad y_h(t) = Ce^{-t}$

$s = -1$

PARTIKULARNO

$y_p(t) = K$

$K = 2$

$y_p(t) = 2$

TOTALNI

$y_t(t) = Ce^{-t} + 2$

$y_t(\ln(2)) = Ce^{-\ln(2)} + 2 = 0$

$= C \cdot \frac{1}{2} + 2 = 0$

$C = -4$

$\boxed{y_t(t) = -4e^{-t} + 2}$

b)