d) $G(S) = \dfrac{100}{\left(\frac{S}{50}+1\right)\left(\frac{S}{100}+1\right)}$

$K_{db} = 20 \log 100 = 20 \cdot 2 = 40\ db$

$\varphi = \operatorname{tg}^{-1} \frac{Im}{Re} = \operatorname{tg}^{-1} 0 = 0°$

Analisis de G_1

$G_1 = \left(\frac{S}{50}+1\right)^{-1} = \left(j\frac{\omega}{50}+1\right)^{-1} = (j\mu+1)^{-1}$ $\qquad \boxed{\mu = \frac{\omega}{50}}$

$= |(j\mu+1)^{-1}| = \left|\frac{1}{j\mu+1}\right| = \frac{1}{\sqrt{\mu^2+1}}$

Módulo

$M = 20 \log \frac{1}{\sqrt{\mu^2+1}} = 20 \log 1 - 20 \log \sqrt{\mu^2+1}$

$M = -20 \log \sqrt{\mu^2+1}$

$\mu \ll 1 \Rightarrow M_{db} = 0\ db$
$(\omega \ll 50)$

$\mu \gg 1 \Rightarrow M_{db} = -20 \log \mu$
$(\omega \gg 50)$

Si $\omega = 500 \Rightarrow \mu = \frac{\omega}{50} = \frac{500}{50} = 10$

$M_{db} = -20 \log 10 = -20\ db$

Fase

$\varphi = \operatorname{tg}^{-1}\left(\frac{Im\, G_1}{Re\, G_1}\right)$ $\qquad G_1 = \frac{1}{1+j\mu} = \frac{1-j\mu}{(1+j\mu)(1-j\mu)} = \frac{1-j\mu}{1+\mu^2}$

$\varphi = \operatorname{tg}^{-1} -\mu = -\operatorname{tg}^{-1}\mu$

$\begin{cases} Re\, G_1 = \frac{1}{1+\mu^2} \\ Im\, G_1 = -\frac{\mu}{1+\mu^2} \end{cases}$

$\mu \ll 1 \Rightarrow \varphi = 0°$
$[\omega \ll 50]$
$(\omega = 5)$

$\mu \gg 1$ $\qquad \varphi = -\operatorname{tg}^{-1} \infty = -90°$
$[\omega \gg 50]$
$\omega = 500$

$\mu = 1 \Rightarrow \omega = 50 \qquad \varphi = -\operatorname{tg}^{-1} 1 = -45°$

Analisis de $\Theta_2 = \dfrac{1}{\frac{S}{100}+1}$

$\mu = \dfrac{\omega}{100} \Rightarrow$ el analisis es el mismo, solo cambia la frec. de corte.