Analog Haberleşme

DSB-LC-AM sorusu çözümü (Z1)

Orijinal not: Z1.pdf

UYARI Bu belge, el yazısı ders notlarından Claude (Anthropic) yardımıyla dijitale aktarılmıştır. Yardımcı kaynak olarak hazırlanmıştır; hata veya eksik içerebilir. Lütfen orijinal notları ve ders kaynaklarını esas alın.

NOTICE *This document was transcribed from handwritten lecture notes with the help of Claude (Anthropic). It is meant as a supplementary resource and may contain errors or omissions. Always check against the original notes and official course material.*

orj. s. 1

Şekil: Bu sayfa basılı materyal içeriyor (ör. ders slaytı); dijitalleştirilmedi. Basılı soruda a3) ve a4) maddeleri yeşil fosforlu kalemle işaretlenmiş.
(orijinal notta, s. 1)

a1)

$$m_n(t) = \frac{m(t)}{m_p} \qquad m_p = 10 + 20 + 10 = 40$$

$$m_n(t) = \frac{10}{40} + \frac{20}{40}\cos(2\pi 1k\,t) - \frac{10}{40}\cos(2\pi 2k\,t)$$
$$= \frac{1}{4} + \frac{1}{2}\cos(2\pi 1k\,t) - \frac{1}{4}\cos(2\pi 2k\,t)$$

$$P_{m_n}(t) = \left(\frac{1}{4}\right)^2 + \frac{\left(\frac{1}{2}\right)^2}{2} + \frac{\left(\frac{1}{4}\right)^2}{2}$$
$$= \frac{1}{16} + \frac{1}{8} + \frac{1}{32} = \frac{2+4+1}{32} = \frac{7}{32}$$

$$\eta = \frac{\mu^2 P_{m_n}}{1 + \mu^2 P_{m_n}} = 0{,}11$$

$$0{,}11 + 0{,}11\,\mu^2 P_{m_n} = \mu^2 P_{m_n}$$

$$\frac{\mu^2 P_{m_n}(1 - 0{,}11)}{(0{,}89)} = \frac{0{,}11}{0{,}89}$$

$$\mu^2 = \frac{0{,}11}{0{,}89 \cdot \frac{7}{32}} = 0{,}565$$

$$\boxed{\Rightarrow \mu = 0{,}75}$$

$$P_c = \boxed{\frac{30^2}{2} = 450\ \text{W}}$$

$$P_s = \frac{\mu^2 A_c^2}{2} P_{m_n}$$

$$P_s = \boxed{55{,}62\ \text{W}}$$

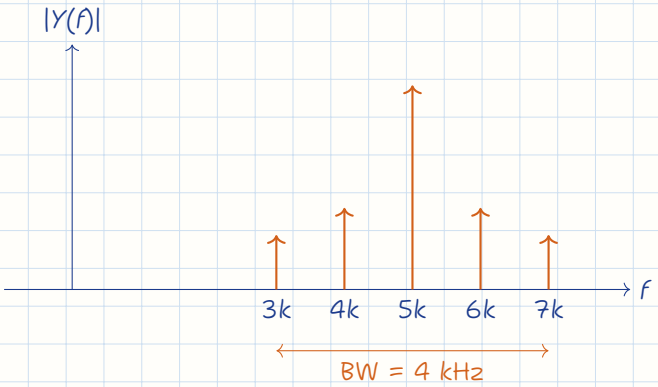
a2)

$$y(t) = A_c\left[1 + \mu m_n(t)\right]\cos(2\pi \overset{5k}{f_c} t)$$
$$= 30\left[1 + \frac{3}{4}\left[\frac{1}{4} + \frac{1}{2}\cos(2\pi 1k\, t) - \frac{1}{4}\cos(2\pi 2k\, t)\right]\right]\cos(2\pi 5k\, t)$$

$$= 30\cos(2\pi 5k\, t) + \frac{3}{16}^{1}\cos(2\pi 5k\, t) + \frac{3}{8}\cos(2\pi 1k\, t)\cos(2\pi 5k\, t)$$
$$- \frac{3}{16}\cos(2\pi 2k\, t)\cos(2\pi 5k\, t)$$
$$= 30{,}19\cos(2\pi 5k\, t) + \frac{3}{16}\cos(2\pi 6k\, t) + \frac{3}{16}\cos(2\pi 4k\, t)$$
$$- \frac{3}{32}\cos(2\pi 7k\, t) - \frac{3}{32}\cos(2\pi 3k\, t)$$

orj. s. 2

$$Y(f) = \frac{30{,}19}{2}\left[\delta(f-5k) + \delta(f+5k)\right] + \frac{3}{32}\left[\delta(f-6k) + \delta(f+6k)\right]$$
$$+ \frac{3}{32}\left[\delta(f-4k) + \delta(f+4k)\right] - \frac{3}{64}\left[\delta(f-7k) + \delta(f+7k)\right]$$
$$- \frac{3}{64}\left[\delta(f-3k) + \delta(f+3k)\right]$$

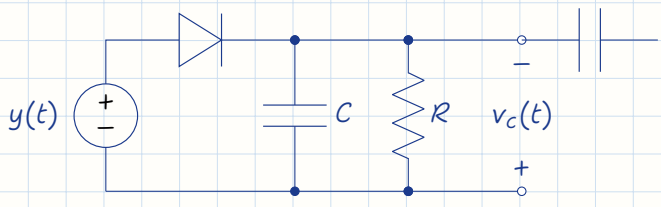


a3) faz tahminsiz demodülatör
non coherent modulator

Zarf Detectörü

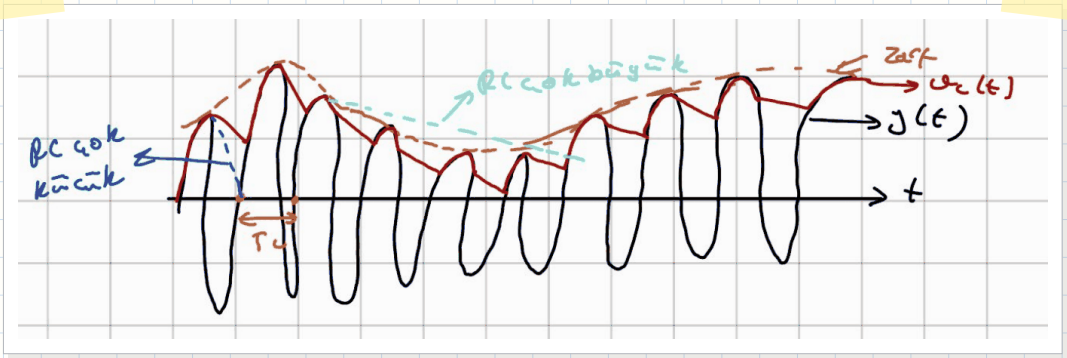
(Envelope detector)

$BG\{m(t)\} = B$ Hz, $f_c \gg B$



[1] Claude notu: muhtemelen 30 çarpanı modülasyon terimlerine de dağıtılmalı: $30 \cdot \frac{3}{16} = \frac{45}{8}$, $30 \cdot \frac{3}{8} = \frac{45}{4}$ vb.

$$y(t) = A_c\left[1 + \mu m_n(t)\right]\cos(2\pi f_c t)$$



orijinal çizim, s. 2

$$\frac{1}{f_c} \ll RC \ll \frac{1}{B}$$

$\frac{1}{f_c} \downarrow \frac{1}{9k} \rightarrow 0{,}1 \cdot 10^{-3}$ $\frac{1}{B} \downarrow$ (mesajın zamandaki değişimi) $\frac{1}{4k} \rightarrow 0{,}25 \cdot 10^{-3}$