M. Hasyim Abdillah P. 1101190095 TT-43-11

$\omega = 2\pi f$

1. $s(t) = [20 + \underbrace{2\cos(3000\pi t)}_{S_1} + \underbrace{10\cos(6000\pi t)}_{S_2}]\cos(2\pi f_c t)$

$f_c = 10^5$ Hz = 100k Satuannya Volt $\rightarrow s(t) = [1 + \mu\cos(\omega_{m_1}) + \ldots]\cos(\omega_c t)$ (μ: indeks modulasi AM)

a. $s(t) = [20 + 2\cos(3000\pi t) + 10\cos(6000\pi t)]\cos(2\pi 10^5 t)$

$s(t) = 20(2\pi 10^5 t) + 2\cos(3000\pi t)\cos(2\pi 10^5 t) + 10\cos(6000\pi t)\cos(2\pi 10^5 t)$

A = 3k, B = 200k; A = 6k, B = 200k

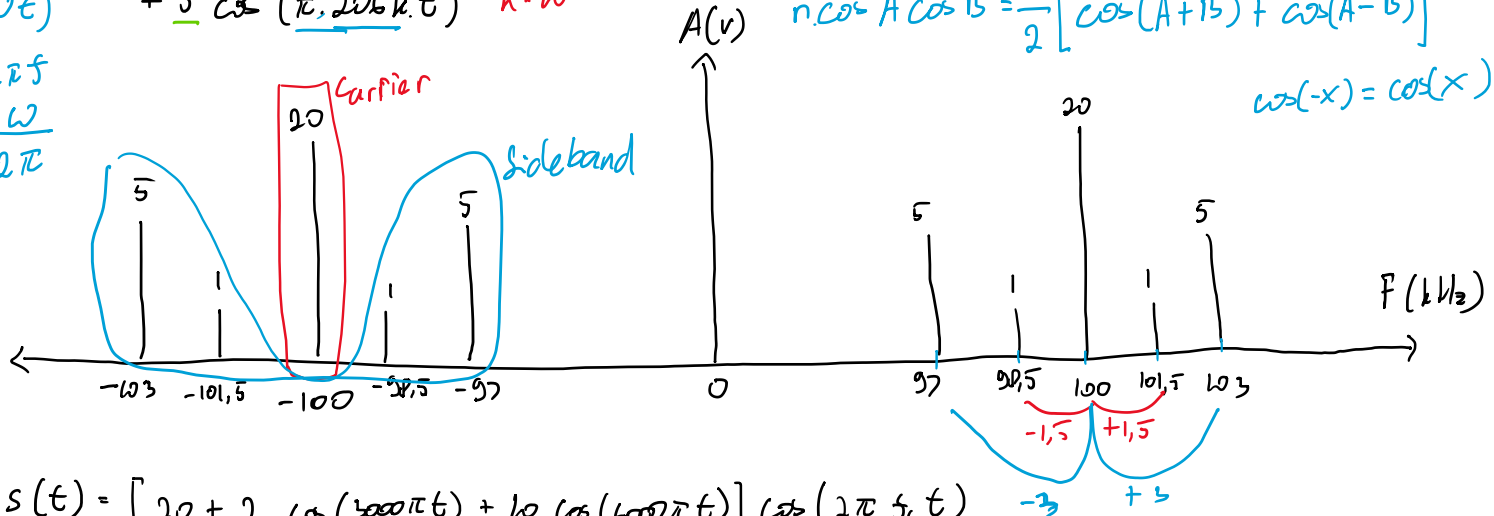
$s(t) = 20(2\pi 10^5 t) + 1\cos(\pi.203k\,t) + 1\cos(\pi.197k\,t) + 5\cos(\pi.194k\,t)$

$+ 5\cos(\pi.206k\,t)$ $k = 10^3$

$\cos(\omega t)$ $\omega = 2\pi f$ $f = \frac{\omega}{2\pi}$

$n\cos A\cos B = \frac{n}{2}[\cos(A+B) + \cos(A-B)]$

$\cos(-x) = \cos(x)$



b. $s(t) = [\underbrace{20}_{20} + \underbrace{2}_{20}\cos(3000\pi t) + \underbrace{10}_{20}\cos(6000\pi t)]\cos(2\pi f_c t)$

$s(t) = 20[1 + \underbrace{0{,}1\cos(3000\pi t)}_{\mu_1} + \underbrace{0{,}5(6000\pi t)}_{\mu_2}]\cos(2\pi f_c t)$

$\mu_T = \sqrt{\mu_1^2 + \mu_2^2} = \sqrt{0{,}1^2 + 0{,}5^2} = 0{,}51$

$\mu_T = \sqrt{\mu_1^2 + \mu_2^2 + \ldots \mu_n^2}$

c. $P_c\,(100\,kHz) = \frac{20^2}{2} = 200$ W/Ω $P = \frac{V^2}{2R}$

$P_{m_1}(100k \pm 1{,}5k) = \frac{1^2}{2} = 0{,}5$ W/Ω

$P_{m_2}(100k \pm 3k) = \frac{5^2}{2} = 12{,}5$ W/Ω

d. Daya pada sideband :

$2P_{m_1} + 2P_{m_2} = 2.0{,}5 + 2.12{,}5 = 26$ W/Ω

Daya total :

$P_c + 2P_{m_1} + 2P_{m_2} = 200 + 26 = 226$ W/Ω

Perbandingan daya total & daya sideband $= \frac{26}{226} = 0{,}115$

2. a. $\mu = 60\% = 0{,}6$ $\quad f_c = 700\ kHz$

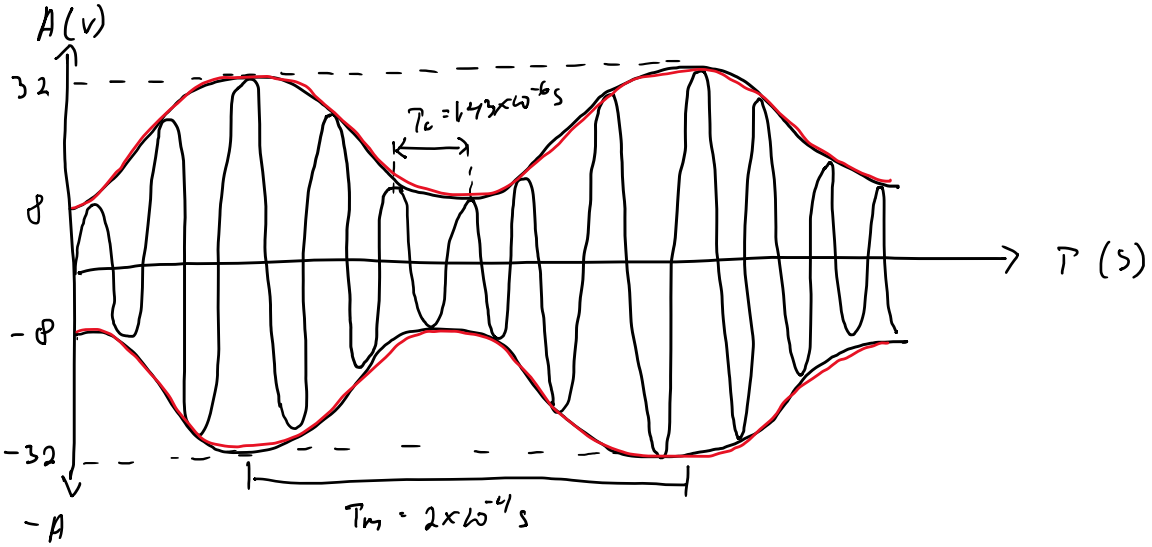
$A_c = 20\ V$ $\quad f_m = 5\ kHz$

$T = \frac{1}{5}$

$A_{max} = H = A_c(1+\mu) = 20(1+0{,}6) = 32\ V$

$A_{min} = h = A_c(1-\mu) = 20(1-0{,}6) = 8\ V$

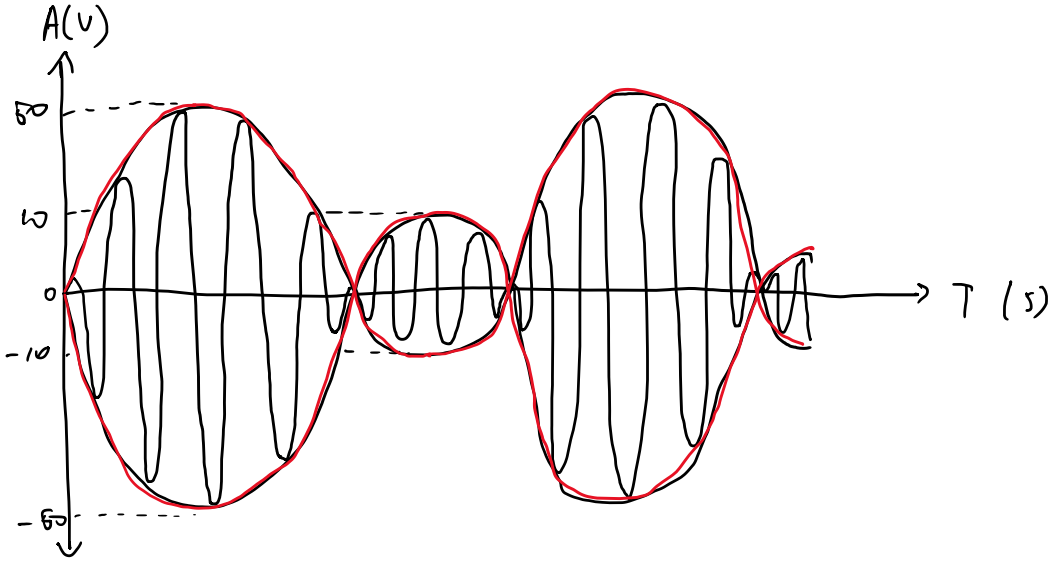
$T_c = \frac{1}{700k} = 1{,}43 \times 10^{-6}\ s$ $\quad T_m = 2 \times 10^{-4}\ s$



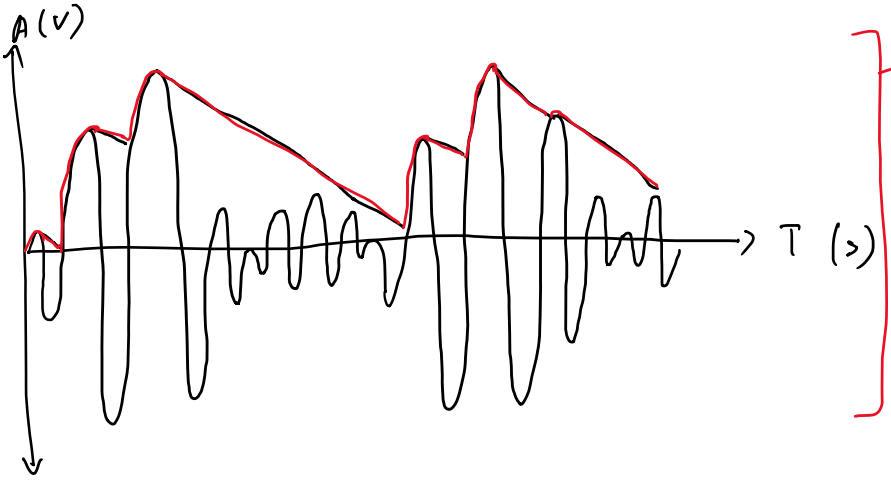
b. $\mu = 150\% = 1{,}5$

$A_{max} = H = A_c(1+\mu) = 20(1+1{,}5) = 50\ V$

$A_{min} = h = A_c(1+\mu) = 20(1-1{,}5) = -10\ V$

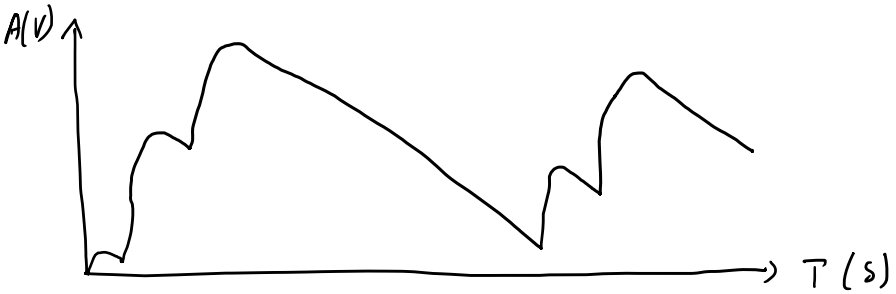


c.



→ Sinyal yg diterima receiver

output :

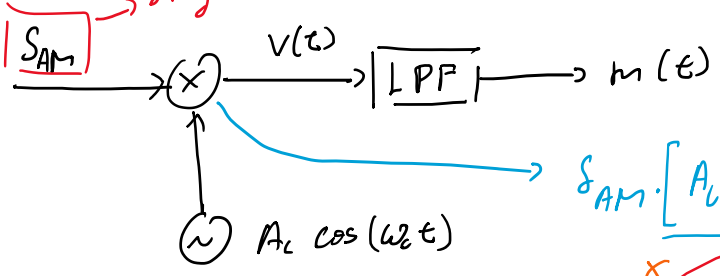


$f_c - f_m \geq 4900$

$f_c >> f_m$

$\omega_c >> \omega_m$

d.



x x

a) $S_{AM} = A_c \cos(\omega_c t) + \left[\frac{1}{2} \mu A_c \cos(\omega_c + \omega_m)t\right] + \left[\frac{1}{2} \mu A_c \cos(\omega_c - \omega_m)t\right]$

b) $V(t) = A_c^2 \cos^2(\omega_c t) + \left[\frac{1}{4} \mu A_c^2 \cos(2\omega_c + \omega_m)t + \frac{1}{4} \mu A_c^2 \cos(\omega_m t)\right]$

$+ \left[\frac{1}{4} \mu A_c^2 \cos(2\omega_c - \omega_m)t + \frac{1}{4} \mu A_c^2 \cos(-\omega_m t)\right]$

c) $m(t) = \frac{1}{4} \mu A_c^2 \cos(\omega_m t) + \frac{1}{4} \mu A_c^2 \cos(-\omega_m t)$

$m(t) = \frac{\mu A_c^2}{2} \cos(\omega_m t)$

$m(t) = \frac{A_m \cdot A_c}{2} \cos(\omega_m t)$

$\mu = \frac{A_m}{A_c}$