King Fahd University of Petroleum & Minerals
Electrical Engineering Department
EE370: Communications Engineering I (091)
Dr. Ali Muqaibel
Quiz 3: Amplitude Modulation

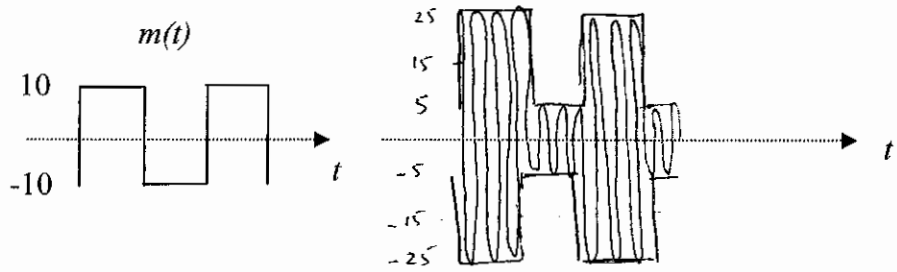
Serial # ○
-1 for not writing your serial number

Name: KEY ver 2.0

The message $m(t)$ is a periodic pulse train as shown in the figure. The signal is modulated using AM.

1) Sketch the AM signal $[A+m(t)]\cos\omega_c t$ corresponding to the modulation index $\mu = 0.666667 = \frac{2}{3}$

$$\mu = \frac{m_p}{A} \Rightarrow A = \frac{m_p}{\mu} = \frac{10}{2/3} = \frac{30}{2} = \boxed{15}$$



2) How much is the power efficiency in this case?

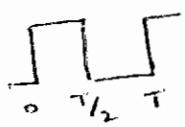
$$\eta = \frac{\widetilde{m^2}}{A^2 + \widetilde{m^2}}$$

$\widetilde{m^2}$ note that squaring the message is always 100
power is the average of the square of the signal

$$\eta = \frac{100}{225 + 100} = \boxed{30.77\ \%}$$

---

if you insist in finding the power using the def:



$$\frac{1}{T}\left[\int_0^{T/2} (10)^2\,dt + \int_{T/2}^{T} (-10)^2\,dt\right] = \frac{100}{T}\left[(T/2 - 0) + (T - T/2)\right]$$

$$= 100$$

15
15
75
15
225

King Fahd University of Petroleum & Minerals
Electrical Engineering Department
EE370: Communications Engineering I (091)
Dr. Ali Muqaibel
Quiz 3: Amplitude Modulation

Serial # 0

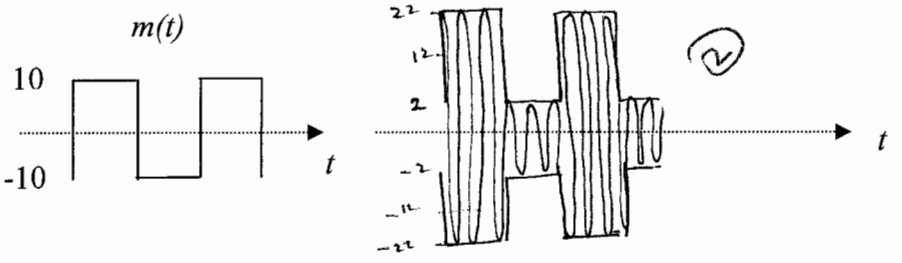
-1 for not writing your serial number

Name: KEY

The message $m(t)$ is a periodic pulse train as shown in the figure. The signal is modulated using AM.

1) Sketch the AM signal $[A+m(t)]\cos\omega_c t$ corresponding to the modulation index $\mu = 0.83333$

$$\mu = \frac{m_p}{A} \Rightarrow A = \frac{m_p}{\mu} = \frac{10}{0.833} = 12 \quad (2)$$



(2)

2) How much is the power efficiency in this case?

$$\eta = \frac{\widetilde{m^2}}{A^2 + \widetilde{m^2}} \quad (1)$$

$\widetilde{m^2}$ note that squaring the message is always 100

Power is the average of the square of the signal (3)

$$\eta = \frac{100}{144 + 100} = \frac{100}{244} = 40.98\ \% \quad (1)$$

(1)

$$\begin{array}{r} 12 \\ 12 \\ \hline 24 \\ 120 \\ \hline 144 \end{array}$$

Good Luck, **Dr. Ali Muqaibel**