BIRZEIT UNIVERSITY

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BIRZEIT UNIVERSITY
Faculty of Engineering
Electrical Engineering Department
Analog Communication Systems- ENEE433
First Exam

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Problem#1(35%)
Consider a triangular message signal, m(t)

$$m(t) = \text{tri}\left(\frac{t}{0.01}\right)$$

a. Find the spectrum of the message signal, $M(f)$
b. Write the time domain of AM modulated signal , $s(t)$. If the amplitude sensitivity of modulator is 0.25 $volt^{-1}$, the carrier frequency is 500 Hz, and the carrier amplitude is 1 $volt$

c. Sketch the time domain of AM modulated signal , $s(t)$. If the amplitude sensitivity of modulator is 0.25 $volt^{-1}$, the carrier frequency is 500 Hz, and the carrier amplitude is 1 $volt$

d. Sketch the frequency domain of the modulated signal described in part b

e. What is the bandwidth of the modulated signal $s(t)$

f. Design the receiver circuit to demodulate the signal, i.e. suggest best values for the circuit parameters

Problem#2:(30%)
For the following circuit shown in figure 1, if the input signal m(t) with bandwidth ω is to demodulate a carrier signal $c(t) = A\cos(\omega_c t)$, and the amplitude A $\gg |\phi(t)|$, The two diodes are identical with resistance r ohm

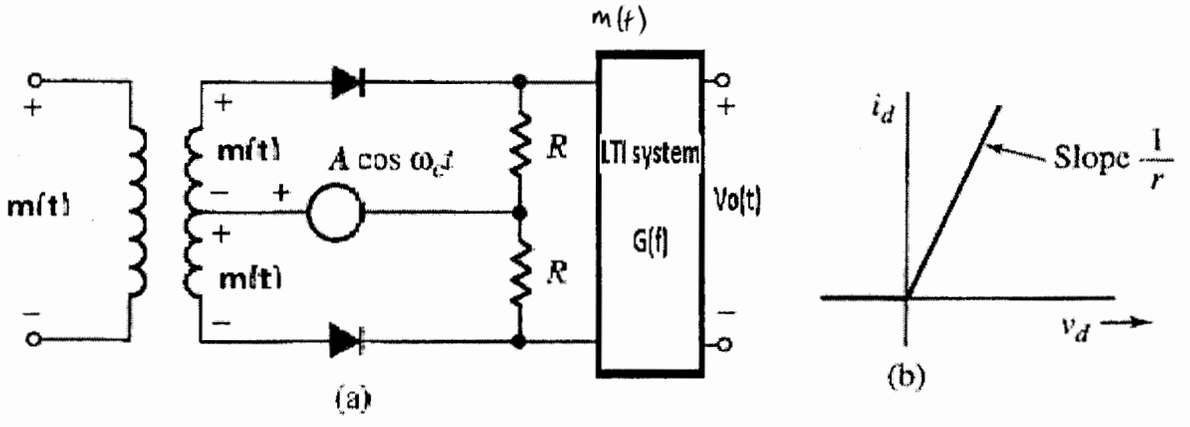

Fig 1

a. Show that the circuit can be used as a DSB-SC modulator, what is the characteristic of $G(f)$
b. Show that the circuit can be used as a DSB-SC demodulator, what is the characteristic of $G(f)$
c. If $m(t) = \sin(\omega_c t + \theta)$, show that the filter output is a dc signal proportional to $\sin(\theta)$

Problem#3:(35%)

A modulated signal is defined by

$$s(t) = [K_1 + K_2 m(t)]\cos(2\pi f_c t) - K_2 g(t)\sin(2\pi f_c t)$$

Is applied to a coherent demodulator whose local oscillator is $2\cos(2\pi f_c t + \theta)$, where θ is a constant phase error between transmitter and receiver.

a. Draw a block diagram of the demodulator.

b. Choose the constants K_1, K_2 and g(t) to find the output of the demodulator for SSB-upper modulated signal.

c. Choose the constants K_1, K_2 and g(t) to find the output of the demodulator for DSB-SC modulated signal.

d. Suggest a reciever that overcome the phase error and draw its block diagram

GOOD LUCK ☺