

ELEC 361 Analog Communication Systems Project

$$m(t) = 5 \cos(2\pi 100t) + 10 \cos(2\pi 200t)$$

$$x(t) = m(t) + c(t) = 5 \cos(2\pi 100t) + 10 \cos(2\pi 200t) + 2 \cos(2\pi 1000t) \cdot \frac{1}{2} [1 + \cos(2\pi 200t)]$$

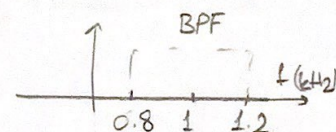
$$z(t) = 60x(t) + x^2(t)$$

$$z(t) = 300 \cos(2\pi 100t) + 600 \cos(2\pi 200t) + 120 \cos(2\pi 1000t) + 25 \cos^2(2\pi 100t) + 100 \cos^2(2\pi 200t) + 4 \cos^2(2\pi 1000t) + 2 [50 \cos(2\pi 100t) \cos(2\pi 200t) + 10 \cos(2\pi 100t) \cos(2\pi 1000t) + 20 \cos(2\pi 200t) \cos(2\pi 1000t)]$$

$$z'(t) = 50 [\cos(2\pi 300t) + \cos(2\pi 100t)] + 10 [\cos(2\pi 1100t) + \cos(2\pi 900t)] + 20 [\cos(2\pi 1200t) + \cos(2\pi 800t)]$$

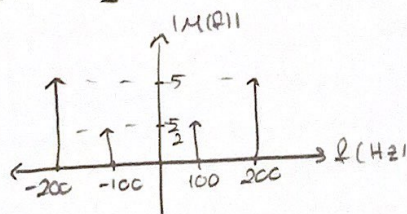
$$z(t) = 300 \cos(2\pi 100t) + 600 \cos(2\pi 200t) + 120 \cos(2\pi 1000t) + 12.5 + 12.5 \cos(2\pi 200t) + 50 + 50 \cos(2\pi 400t) + 2 + 2 \cos(2\pi 2000t) + 50 \cos(2\pi 300t) + 50 \cos(2\pi 100t) + 10 \cos(2\pi 1100t) + 10 \cos(2\pi 900t) + 20 \cos(2\pi 1200t) + 20 \cos(2\pi 800t)$$

Band pass filter gain 1 Band width 400 Hz $f_c = 1 \text{ kHz}$

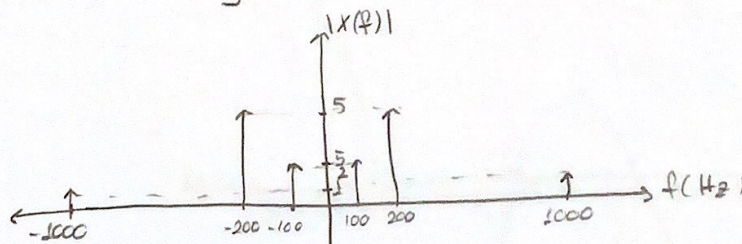


$$y(t) = 120 \cos(2\pi 1000t) + 10 \cos(2\pi 1100t) + 10 \cos(2\pi 900t) + 20 \cos(2\pi 1200t) + 20 \cos(2\pi 800t)$$

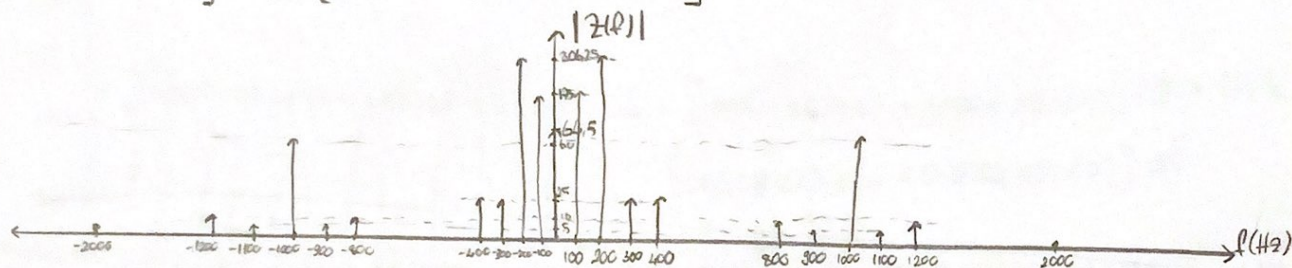
$$M(f) = \frac{5}{2} [S(f-100) + S(f+100)] + 5 [S(f-200) + S(f+200)]$$



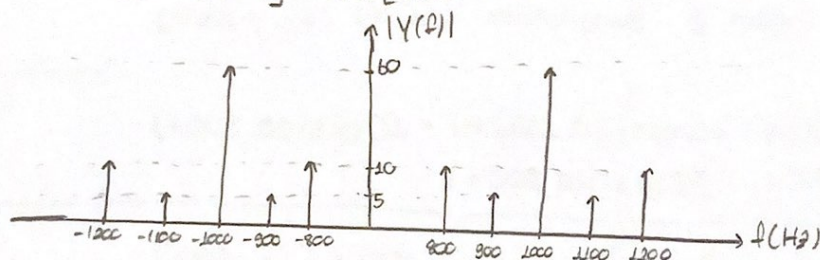
$$X(f) = \frac{5}{2} [S(f+100) + S(f+200)] + 5 [S(f-200) + S(f+200)] + S(f-1000) + S(f+1000)$$



$$Z(f) = 64.5 \delta(f) + 150 [\delta(f-100) + \delta(f+100)] + 300 [\delta(f-200) + \delta(f+200)] + 60 [\delta(f-1000) + \delta(f+1000)] + 6.25 [\delta(f-200) + \delta(f+200)] + 25 [\delta(f-400) + \delta(f+400)] + \delta(f-2000) + \delta(f+2000) + 25 [\delta(f-300) + \delta(f+300)] + 25 [\delta(f-100) + \delta(f+100)] + 5 [\delta(f-1100) + \delta(f+1100)] + 5 [\delta(f-900) + \delta(f+900)] + 10 [\delta(f-1200) + \delta(f+1200)] + 10 [\delta(f-800) + \delta(f+800)]$$



$$Y(f) = 60 [\delta(f-1000) + \delta(f+1000)] + 5 [\delta(f-1100) + \delta(f+1100)] + 5 [\delta(f-900) + \delta(f+900)] + 10 [\delta(f-1200) + \delta(f+1200)] + 10 [\delta(f-800) + \delta(f+800)]$$



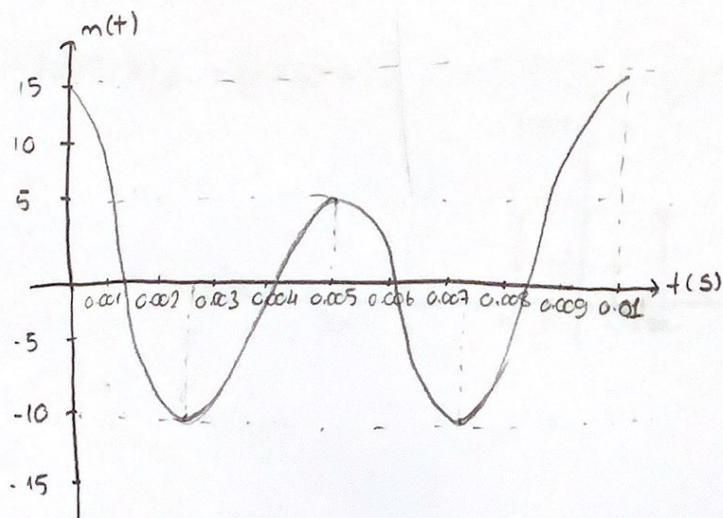
$$m(t) = 5 \cos(2\pi 100t) + 10 \cos(400\pi t)$$

$$t = 0 \text{ s} \Rightarrow m(0) = 15$$

$$t = 0.005 \text{ s} \Rightarrow m(0.005) = 5$$

$$t = 0.0027 \text{ s} \Rightarrow m(0.0027) = -10$$

$$t = 0.0072 \text{ s} \Rightarrow m(0.0072) = -10$$



$$x(t) = 5\cos(2\pi 100t) + 10\cos(2\pi 200t) + 2\cos(2\pi 1000t)$$

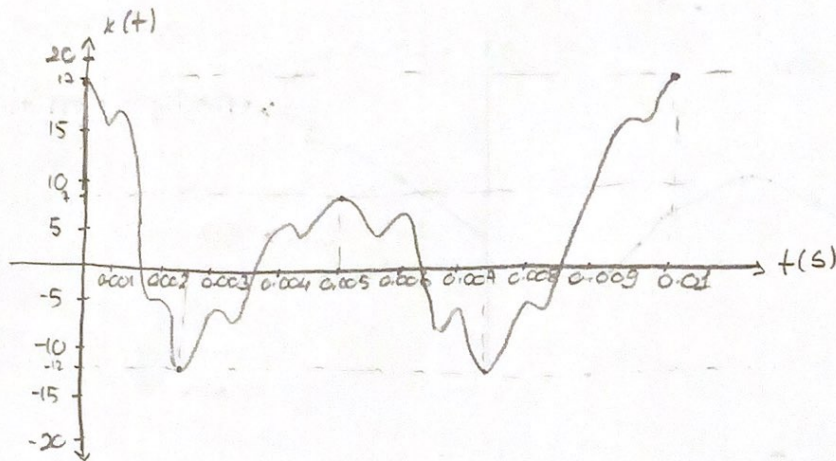
$$t = 0 \text{ için } x(0) = 17$$

$$t = 0.005 \text{ için } x(0.005) = 7$$

$$t = 0.0025 \text{ için } x(0.0025) \approx -12$$

$$t = 0.0075 \text{ için } x(0.0075) \approx -12$$

$$t = 0.01 \text{ için } x(0.01) = 17$$



$z(t)$ için ;

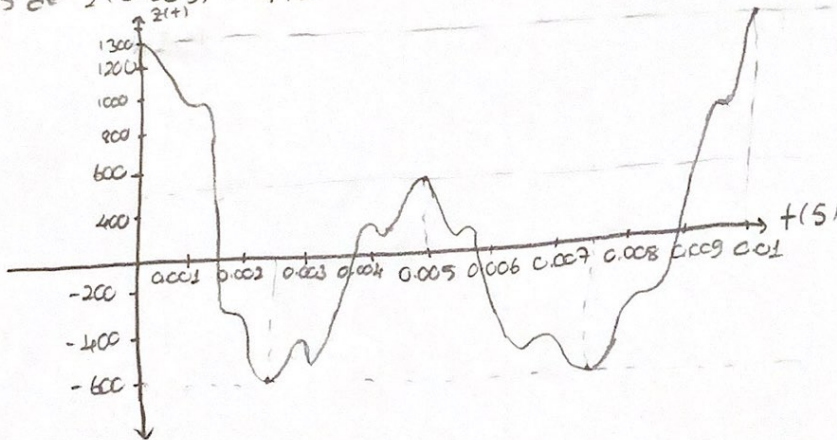
$$t = 0 \text{ da } z(0) = 1300$$

$$t = 0.0025 \text{ de } z(0.0025) \approx -600$$

$$t = 0.0075 \text{ de } z(0.0075) \approx -600$$

$$t = 0.01 \text{ de } z(0.01) = 1300$$

$$t = 0.005 \text{ de } z(0.005) \approx 470$$



$$y(t) = 120 \cos(2\pi 1000t) + 10 \cos(2\pi 1100t) + 10 \cos(2\pi 900t) + 20 \cos(2\pi 1200t) + 20 \cos(2\pi 800t)$$

$$t = 0 \text{ then } y(0) \approx 180$$

$$t = 0.0005 \text{ then } y(0.0005) \approx -170$$

$$t = 0.001 \text{ then } y(0.001) \approx 150$$

$$t = 0.0015 \text{ then } y(0.0015) \approx -120$$

$$t = 0.002 \text{ then } y(0.002) \approx 95$$

$$t = 0.0025 \text{ then } y(0.0025) \approx -80$$

$$t = 0.003 \text{ then } y(0.003) \approx 81$$

$$t = 0.0035 \text{ then } y(0.0035) \approx -95$$

$$t = 0.004 \text{ then } y(0.004) \approx 115$$

$$t = 0.0045 \text{ then } y(0.0045) \approx -133$$

$$t = 0.005 \text{ then } y(0.005) \approx 140$$

Amplitude (Demodulated Signal)

