EE352 – Communication Systems I Laboratory

Lab 6 Report

Frequency Modulation/Demodulation

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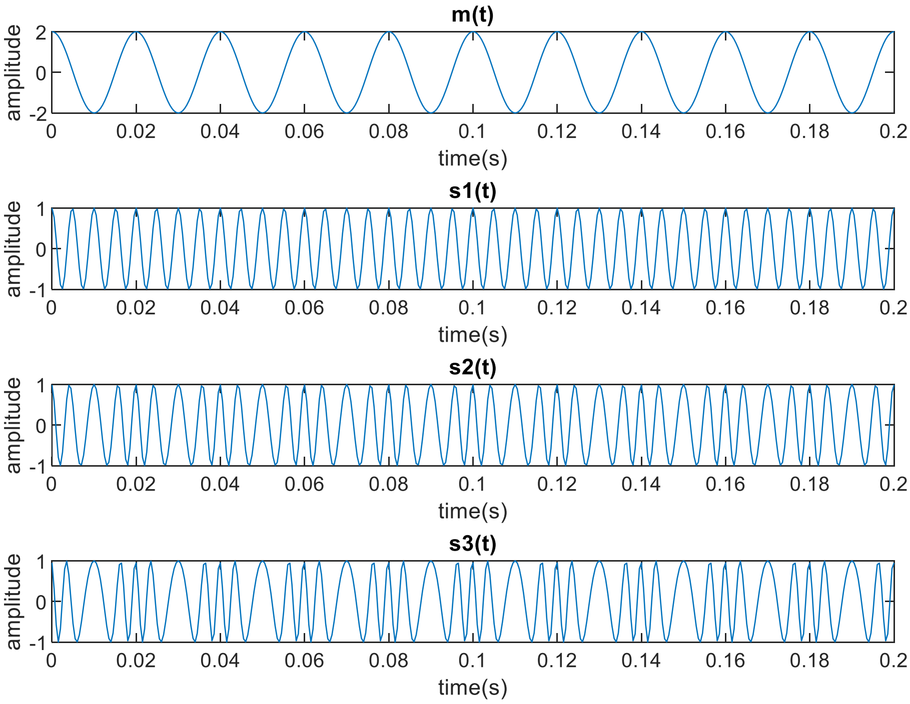
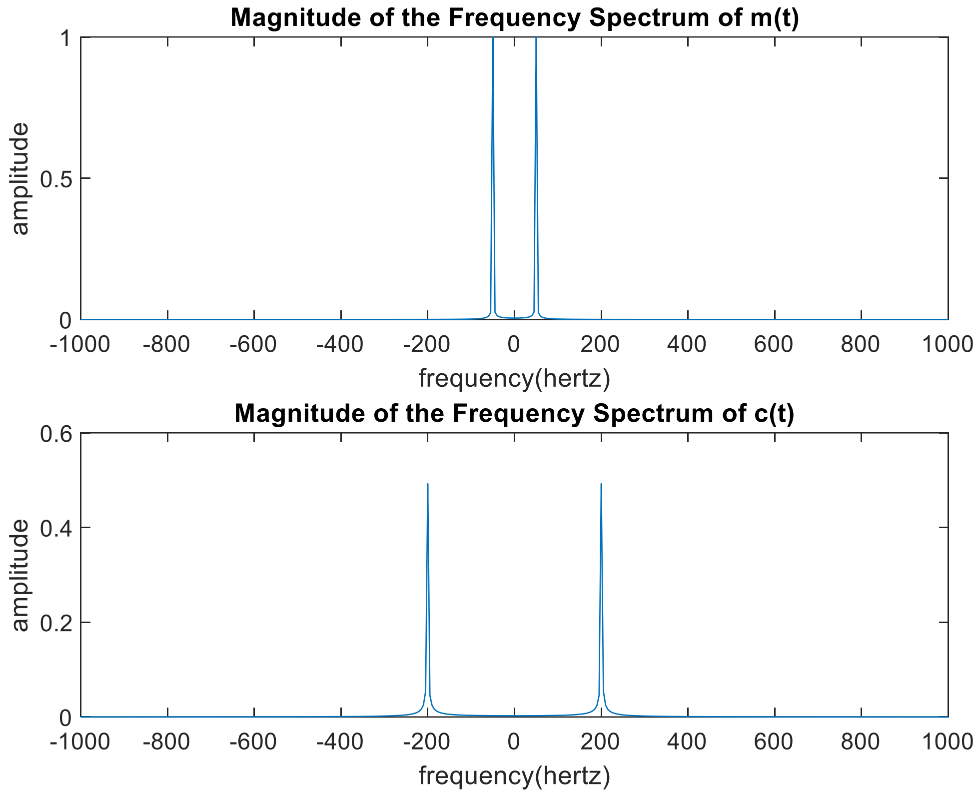


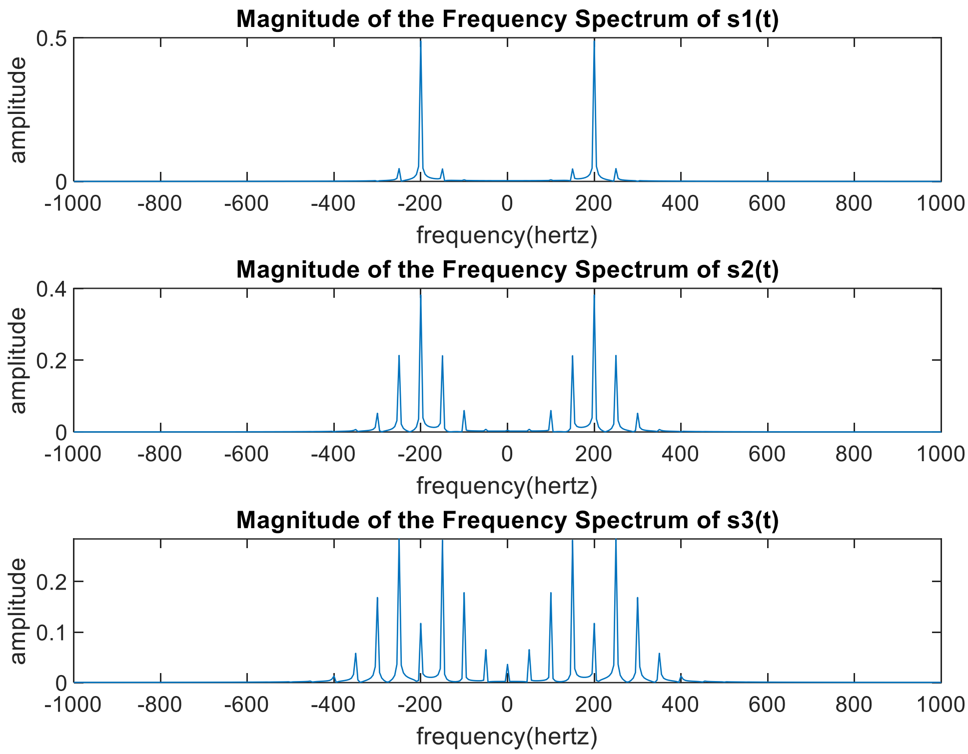
In this figure, we can see our message signal m(t) = Am cos (2πfm t) where Am=2 and fm=50Hz and our frequency modulated signals which is equal to $s(t) = Ac * \cos\,(2\pi fct + 2\pi kf \int_0^t m(T)dT)$ for different frequency sensivity factor Kf values(respectively 5,25,50) in time domain. According to graph we can say, when frequency sensitivity factor increasing, the transitions in our signal become sharper, and we can see this from the gap differences that occur. As we can see in the formula, when frequency sensitivity factor increases, fi increases by the reason of inceasing in the value of range of the cos.

$$fi(t) = fc + kfAmcos(2\pi fmt) = fc + \Delta\mathrm{fcos}(2\pi\mathrm{fmt})$$



According to this figure, in the top of the figure for frequency response of message signal(m(t)), we can say we have 1 magnitude at -+50 Hertz which is equal to our fm value. We waiting this graph because of our signal m(t) = Am cos (2πfm t) where Am=2 and fm=50Hz because of fourier transform of cos formula our magnitude is 2*(1/2)=1.

In bottom of the figure for frequency response of carrier signal(c(t)), we can say we have 0.5 magnitude at -+200 Hertz which is equal to our fc value. We waiting this graph because of our signal c(t) = Ac cos (2πfc t) where Ac=1 and fm=200Hz because of fourier transform of cos formula our magnitude is 1*(1/2)=1/2.

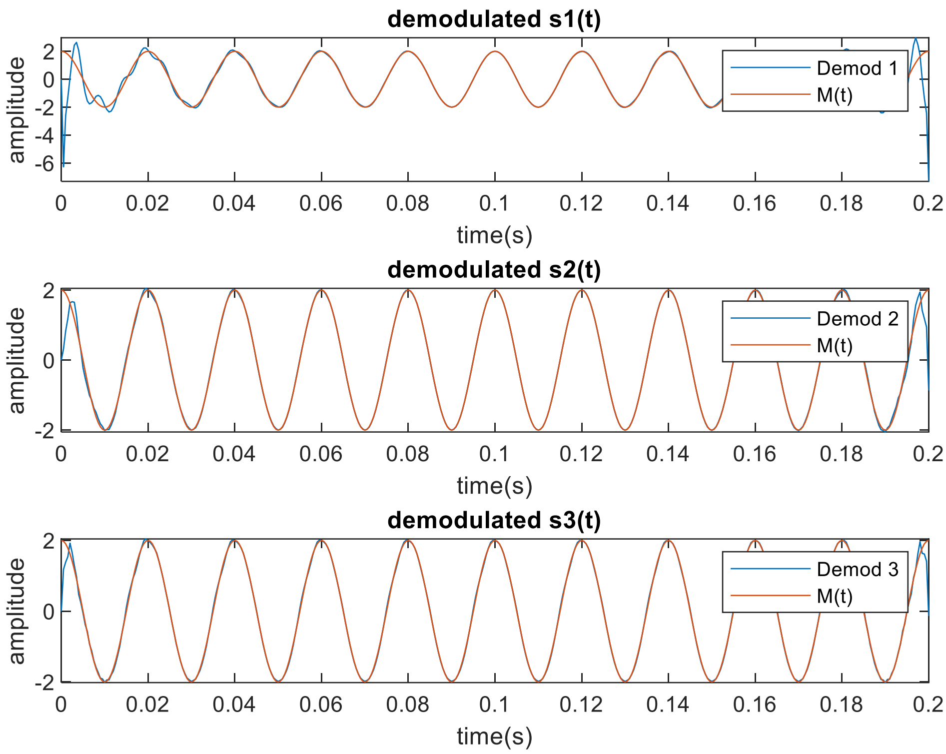


According to this graph, we can see frequency response of our frequency modulated signals which is equal to $s(t) = Ac * \cos\,(2\pi fct + 2\pi kf \int_0^t m(T)dT)$ for different frequency sensivity factor Kf values(respectively 5,25,50) in time frequency domain.According to Carson's Rule we can say our signal can be narrowband or sideband according to Kf value because β= Kf*Am/fm and if β is <1 our signal is narrowband and if β >1 our signal is sideband.

➔ In the top of the figure we can say β=0.1 so that we have Narrow Band because of that we have impulses at fc, fc+fm, fc-fm, -fc,-fc-fm,-fc+fm hertz values.

➔ In the middle of the figure we can say β=1 so that we have WideBand because of that we use Bessel function and because of our modulation index is 1, we have three impulses with fm spacing are formed on each side of the carrier frequency.

➔ In the bottom of the figure we can say β=2, so that we have WideBand because of that we use Bessel function and because of our modulation index is 2, we have five impulses impulses with fm spacing are formed on each side of the carrier frequency.



According to this graph, we can see comparison our message signal with our demodulated signal for different frequency sensivity factor Kf values(respectively 5,25,50). In the top of the figure we can say we see some distortion at start and end points. Also we can see some distortion but it is fewer at the middle of the figure. At the bottom of the figure also we can see some distortion in the this graph. Finally we can say, middle of the figure is the closest so that, we can say 25 is the best Kf value between our values because we observed decays increasing when Kf value increases or decreases.