[1.]PROBLEM STATEMENT: FM demodulation using Foster-Seeley technique.

- Transfer function of Foster Seeley discriminator.
- Implementation in Frequency domain.
- Implementation in time domain.
- Use envelop detector to get back message signal.

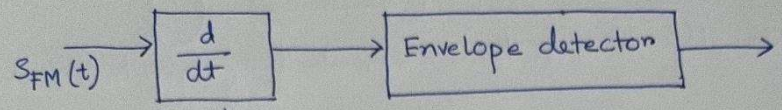
[2.]BRIFE THEORY & BACKGROUND: The Foster Seeley circuit is probably most commonly called the Foster Seeley discriminator. This is really a hang-over from early days of FM, and today the terms detector or probably better demodulator would probably be used.

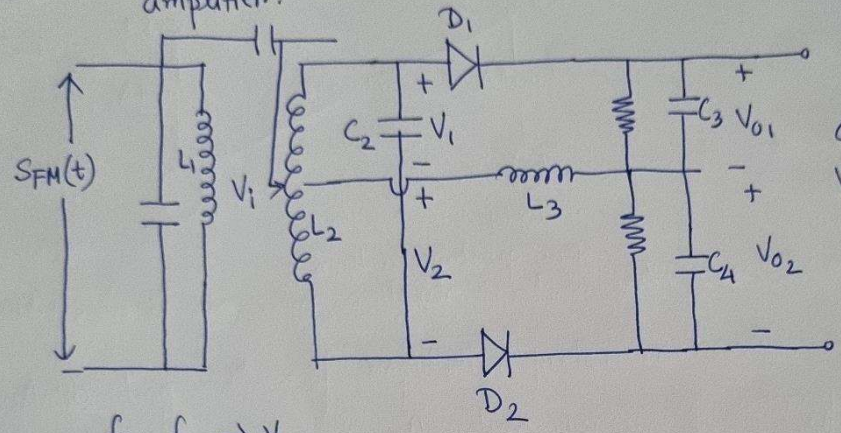
The Foster Seeley discriminator circuit is characterised by the transformer, choke and diodes used within the circuit that forms the basis of its operation.

- ADVANTAGES: 1. Offers good level of performance and reasonable linearity. 2. Simple to construct using discrete components. 3. Provides higher output than the ratio detector. 4. Provides a more linear output.
- DISADVANTAGES: 1. Does not easily lend itself to being incorporated within an integrated circuit. 2. High cost of transformer. 3. Narrower bandwidth than the ratio detector. 4. The circuit is sensitive to both frequency and amplitude and therefore needs a limiter before it to remove amplitude variations and hence amplitude noise.

In bellow part I described the full part of that Foster Seeley discriminator circuit in pen paper:

$S_{FM}(t) = A_c \cos\left[2\pi f_c t + k_f \int m(t)dt\right]$





output Voltage.
$V_0 = |V_1| - |V_2|$

$f_i = f_c \Rightarrow V_0$

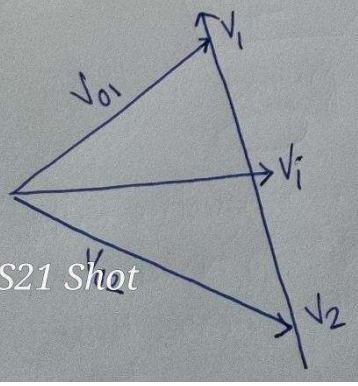
$f_i > f_c \Rightarrow +Ve$

$f_i < f_c \Rightarrow -Ve$

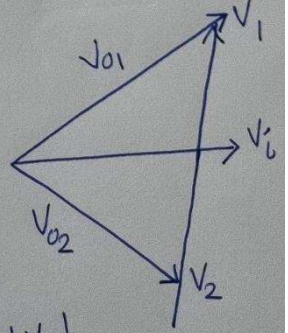
$$T.F = \eta\, g_m E_c \omega_c L Q_c \frac{\left[(1+(x+a)^2)^{1/2} - (1-(x+a)^2)^{1/2}\right]}{\left[(1+b^2-x^2)^2 + 4x^2\right]}$$

$\eta = 1$, $g_m = 0.1\,s$. $E_c = 1V$, $L = 0.001H$ $a = 1.0274$, $b = 1$

$$x = 2Q_e \frac{(f-f_c)}{f_c}, \quad Q_e = \frac{f_c}{2k_f A_m}.$$



$V_0 = |V_{02}| - |V_{01}|$



$V_0 = |V_{02}| - |V_{01}|$

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        fprintf(fp1,"%f\t%f\t%f\t%f\t%f\t%f\t%f\t%f\t%f\t%f\t%f\t%f\t%f\n",time[i],Yfm[i],real_dft[i],Img_dft[
i],TF_real[i],TF_imag[i],Y_real[i],Y_imag[i],real_idft[i],imag_idft[i]);
    }

    fclose(fp1);
```

[4.]MATLAB CODE & PLOT FOR THIS EXPERIMENT:

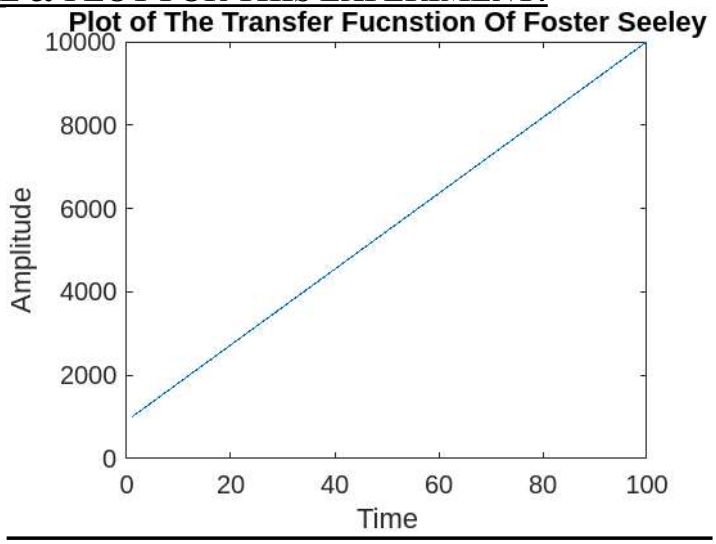


Fig: Transfer Function Output

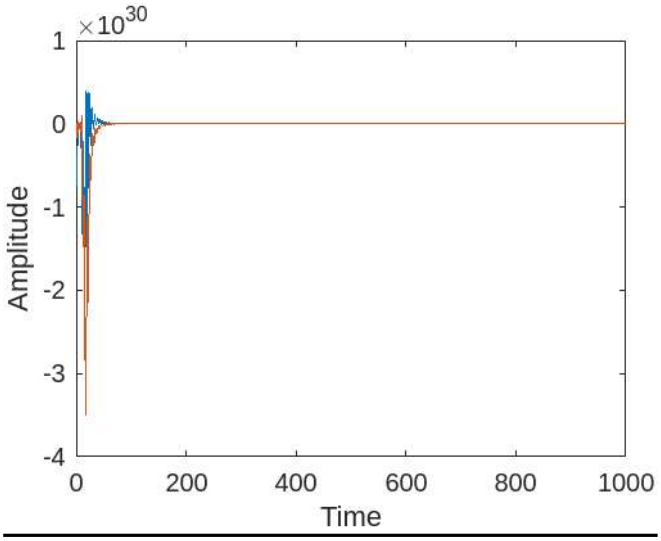


Fig: Combined DFT Of real & Imaginary part of Transfer Function

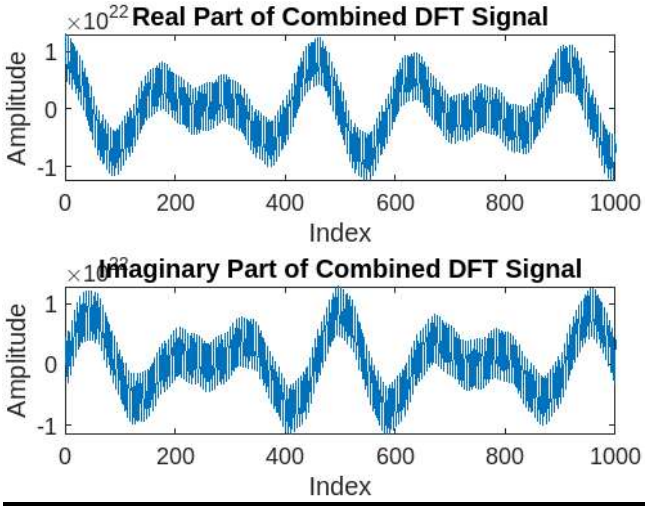
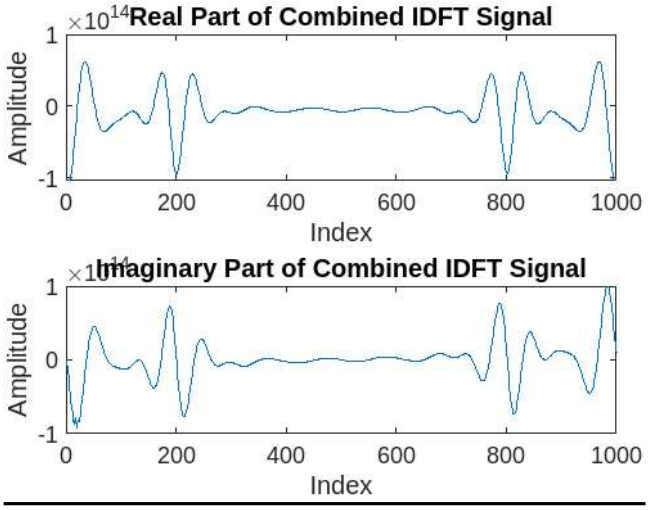


Fig: Output of Foster Seeley discriminator



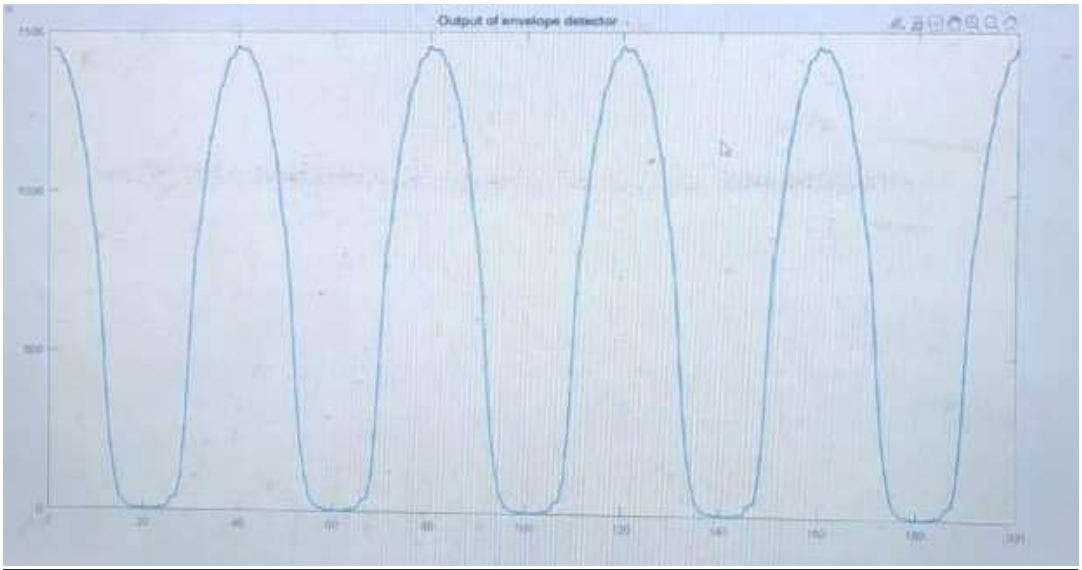


Fig: Output of Envelop Detector.