**Experiment -06**

**SSB- MODULATION AND DETECTOR**

fs = 8000;

fm = 20;

fc = 50;

am = 1;

ac = 1;

T = 1;

t = 0:1/fs:T-1/fs;

m1 = am \* cos(2 \* pi \* fm \* t);

subplot(5, 1, 1);

plot(t, m1);

title('Message Signal');

xlabel('Time (s)');

ylabel('Amplitude');

c1 = ac \* cos(2 \* pi \* fc \* t);

subplot(5, 1, 2);

plot(t, c1);

title('Carrier Signal (Cosine)');

xlabel('Time (s)');

ylabel('Amplitude');

m2 = am \* sin(2 \* pi \* fm \* t);

c2 = ac \* sin(2 \* pi \* fc \* t);

susb = 0.5 \* m1 .\* c1 - 0.5 \* m2 .\* c2; % Upper Sideband (USB)

subplot(5, 1, 3);

plot(t, susb);

title('SSB-SC Signal (USB)');

xlabel('Time (s)');

ylabel('Amplitude');

slsb = 0.5 \* m1 .\* c1 + 0.5 \* m2 .\* c2; % Lower Sideband (LSB)

subplot(5, 1, 4);

plot(t, slsb);

title('SSB-SC Signal (LSB)');

xlabel('Time (s)');

ylabel('Amplitude');

demodulated\_signal\_usb = susb .\* cos(2 \* pi \* fc \* t); % Demodulation of USB

[b, a] = butter(4, fm/(fs/2), 'low'); % Butterworth filter design

demodulated\_message\_usb = filter(b, a, demodulated\_signal\_usb);

demodulated\_signal\_lsb = slsb .\* cos(2 \* pi \* fc \* t); % Demodulation of LSB

demodulated\_message\_lsb = filter(b, a, demodulated\_signal\_lsb);

subplot(5, 1, 5);

plot(t, demodulated\_message\_usb, 'b', t, demodulated\_message\_lsb, 'r');

title('Demodulated Signals (USB and LSB)');

xlabel('Time (s)');

ylabel('Amplitude');

legend('Demodulated USB', 'Demodulated LSB');

