**Lab 3 Report**

1. **Simulation**

Write a matlab code to simulate the DSB-SC modulator-demodulator (MODEM). Assume that the carrier frequency is 64 kHz and the message is a single tone (sinusoid) at frequency 4 kHz. You may modify the matlab code “dsb\_sc\_modem.m”.

1. Plot the DSB-SC signal both in the time and frequency domains.
2. Add a carrier to the DSB-SC signal so that it becomes the standard AM signal. Consider the following cases: (i) the carrier power is half of the total power in both the sidebands. (ii) the carrier power is three times the total power of the sidebands (iii) the carrier power is more than the three times the total power of the sidebands.
3. Multiply the DSB-SC signal (without the carrier addition) by a LO which is phase-synchronized with the carrier, i.e. cos(2πfc t). Let this be s’(t). Plot s’(t) in both the time and frequency domain
4. Let s’(t) pass through an ideal low pass filter which has a cutoff frequency greater than 4 kHz (but less than 124 kHz so that the spectrum around 128 kHz is blocked) and let the output of the LPF be m’(t). Plot m’(t) in both the time and frequency domains.
5. **Experimental Details**

*Transmit Section:*

1. Plot the observed DSBSC waveform and the simulated DSB-SC waveform (i.e. Section 1(i)) in the same figure (in both the time and frequency domains). Introduce a suitable amplitude scaling factor, if needed. Do you see any discrepancies between the two? Explain.
2. Vary the potentiometer PT2 (which adds the carrier) and observe the effect on the signal in both the time and frequency domains. Write a brief description comparing your observed time and frequency domain signals with your matlab plots for the standard AM (i.e. Section 1(ii))
3. Explain how the 4 kHz message signal is generated by the board.

*Receive Section:*

1. Write a brief description comparing the signal at TP4 with that obtained from the matlab simulations (i.e. 1(iii)) in both the time and frequency domains.
2. Compare the demodulated output at TP5 with that obtained from the matlab simulations (i.e. 1(iv)). Comment on the similarity of the demodulated output to the original message m(t). What can be done to improve the similarity?
3. Describe the observation you have made by varying PT1.
4. **Matlab code**

Attach the matlab codes used for simulations.