ECS330 EECS LAB II
2020-21-II
Lab Exam – 50 Marks
Date assigned: 16 April 2021, 10 AM
Due date: 16 April 2021, 6 PM

*Instructions:*

- *Clearly write your name and roll number on the first page of your answer sheet.*
- *Copying is strictly prohibited. Full marks will be deducted if anyone is found copying the answer.*
- *You can handwrite and scan or type your answer directly on a word document or pdf file. Save the file with a name according to your own name and roll number.*
- *Screenshots of LT-Spice/ MATLAB results can be put on the same doc or pdf file, similar to what you did in your Lab-report.*
- *Answer sheets should be emailed to Mr. Anurag (**anuragb@iiserb.ac.in**) before 6 PM today.*

Questions:

(1) Consider a message signal which is a pure sinusoidal wave of frequency $f_m$ = 250 Hz and a carrier signal which is also a pure sinusoidal wave of frequency $f_c$ = 750 Hz. The message signal is modulated using double side-band suppressed carrier modulation technique. The modulated signal is passed through a coherent detector. Plot the magnitude spectrum of the output of the coherent detector.

[15]

(2)

a. Draw the circuit diagram of a half adder circuit and label your circuit accordingly. You may use LT Spice for the same. Write down the truth table for a half adder.
b. Suppose you have an unlimited number of half adder ICs available with you. Let those ICs be represented by the following schematic. The variables in the diagram below have their usual meaning.


Using only the half adder ICs draw a circuit schematic of a two-bit parallel adder. Implement the schematic of the full adder in LTSpice and check your results for:

1. A=10 & B=00
2. A=11 & B=10

[10+10=20]

(3) Design a wave shaping circuit using diodes, which can clip the signal amplitude when it is greater than 2V. Consider a sine wave as an input with a frequency of 10kHz and a peak value of 4V. Show the input and output waveforms.

[15]