# Birla Institute of Technology & Science, Pilani, Rajasthan
First Semester 2021-2022
Mid-Semester Lab Test (28-11-2021)

Course: EEE F311 Communication Systems
Instructor-in-Charge: S M Zafaruddin

Duration: 180 Minutes, Marks =14

MATLAB

1. There are two messages $m_1(t) = 10 sinc(10\pi t)$ and $m_2 = 5 + \sin(1000\pi t)$. Use the real time code to transmit one of the messages selected randomly every half-second. Use DSB-SC for $m_1(t)$ and AM for $m_2(t)$ and transmit over a channel $h(t) = \delta(t)$. Add an AWGN of variance 2. Apply synchronous detector for $m_1(t)$ and envelop detector for $m_2(t)$. Use the carrier signal with a power 18 Watt and carrier frequency must be less than 10 times of the message frequency/bandwidth. Use the real time code template as attached in the instruction PDF.
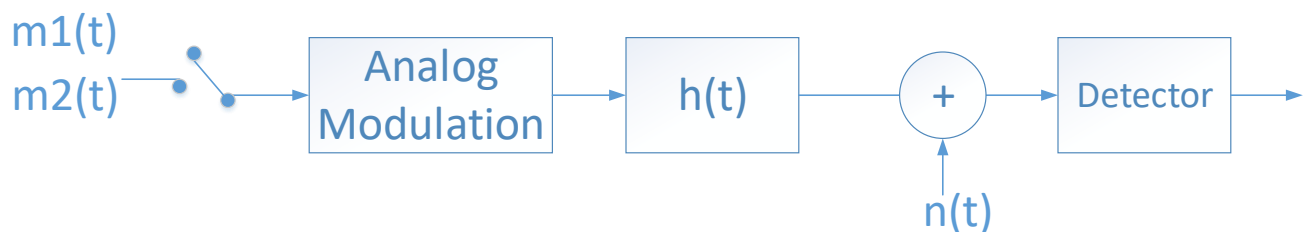
   (a) Plot the modulated signal in time and frequency domain for 20 seconds. [**2 Marks**].
   (b) Plot the demodulated signal in time and frequency domain for 20 seconds. [**3 Marks**].

2. The dial tone is a continuous tone of the addition of frequencies 350 and 440 Hz. Generate dial tone for 15 seconds and transmit using frequency modulation over a distortion-less channel.

   (a) Demodulate the FM signal by plotting the time-domain and frequency domain of the demodulated signal in two separate figures. [**2 Marks**]
   (b) Use the command "sound" on the demodulated time-domain signal to verify the received dial tone. [**3 Marks**]

MATLAB/Python

3. (a) Use only sinusoidal signals to generate a square pulse. [**1 Mark**]
   (b) The PDF of a random variable is given as $f_X(x) = \frac{1}{4}e^{(-\frac{|x-2|}{2})}$. Find $P(X \leq 1)$. [**1 Mark**]
   (c) Generate a Gaussian random process and plot its autocorrelation function and PSD. [**2 Marks**]