Vellore Institute of Technology

Continuous Assessment Test – I

Programme Name & Branch: B. Tech ECE **Winter Semester 2019-2020**

Course Name & Code: Analog Communication Systems & ECE 3001

Class Numbers: VL2019205005183/5181/5174/5175/5178/6856

Slot: F1 **Exam Duration: 90 min** **Max Marks: 50**

General instructions: Answer all questions

1	a) What do you mean by simplex, half-duplex and full-duplex communication systems? Give example for each type.	[3]
	b) List the portions of the electromagnetic spectrum used for VHF and UHF services. Determine the minimum size of an antenna that can operate in the UHF band.	[3]
	c) "The motivation to proceed from standard AM to DSB-SC is to reduce the amount of power wasted in transmitting the carrier component." Justify the above statement by proving that the carrier component uses up a significant amount of the total power needed to transmit an AM signal by considering the modulation index m=0.4. Give the ratio of the sideband power to the total power.	[4]
2	a) Give a basic block diagram and explain the main logic of the square law modulator for the generation of an AM signal without any mathematical derivations. b) Rohit used a message signal $5cos\,(100\pi t)$ and the carrier signal $10cos\,(250\pi t)$ as the input to the square-law device mentioned above. Determine the signal v_{out} at the output of the square-law device and draw its frequency spectrum. Determine whether Rohit can get a pure AM signal at the output after suitable filtering. Also, predict whether the same carrier and message signal could be used in a switching modulator to successfully generate an AM signal.	[3] [7]
3	An amplitude modulated signal is shown in Fig.1 below. Determine the following a) the modulation index and the expression of the expression of the modulated signal.	[10]

b) the total average power of the modulated signal, the carrier power, the USB power and the LSB power (assume unit load).

c) the modulation efficiency.

d) the amplitude of the message signal.

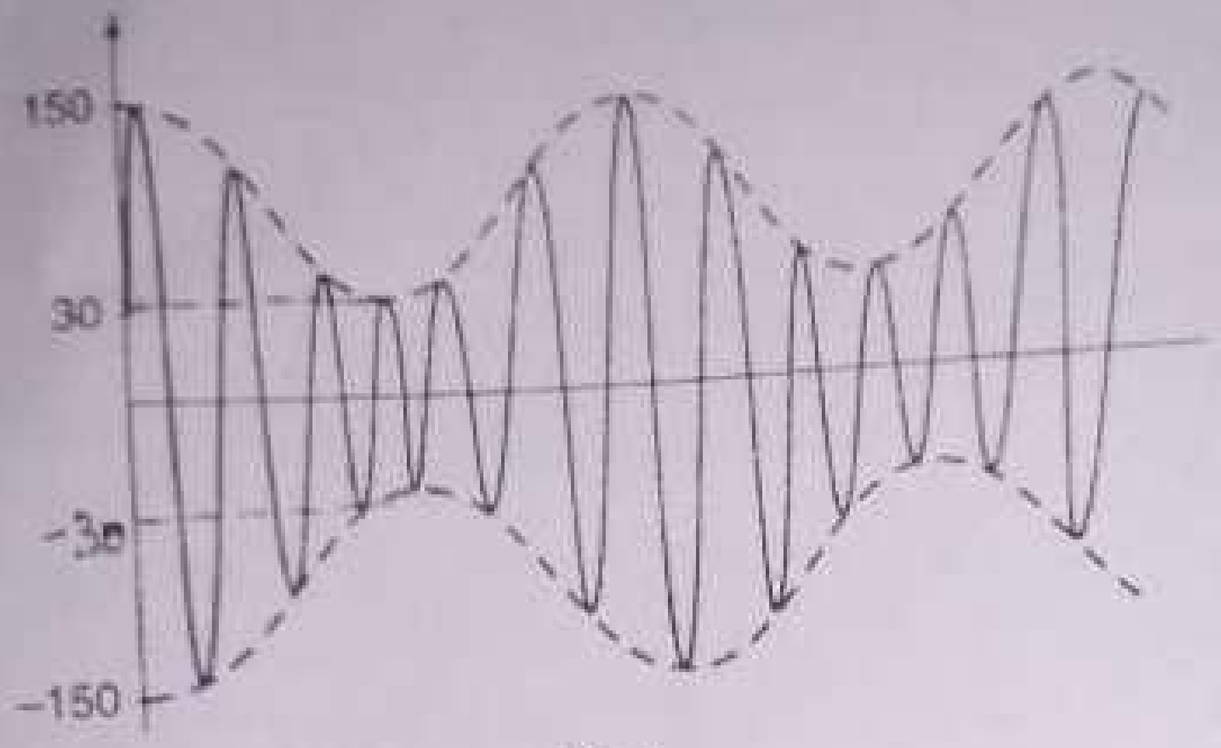

Fig. 1

4	a) Describe the generation of DSB-SC signal using a Ring modulator with the help of a suitable block diagram and necessary derivations.	[6]
	b) Highlight the role of the local oscillator in a coherent detector. Priya generated the signal $sin\,(2\pi 10^6 t)$ at the local oscillator to demodulate a DSB-SC signal $s(t) = 10m(t)\cos(2\pi 10^6 t)$. To her utter dismay, there was no signal at the output of the low-pass filter. Can you guess what could have happened by evaluating the signal received at each stage i.e., before the LPF and after the LPF. Explain in detail about the problem that Priya just encountered?	[4]
5	a) Illustrate a method to generate an SSB-SC signal using phase discrimination.	[5]
	b) "SSB-SC is suitable for the transmission of speech signals but not for signals such as audio and video as they have a significant energy content around DC frequency i.e., SSB-SC is suitable only for such signals whose spectra have an energy gap around the origin." Justify. What problems could arise if audio and video signals are SSB-SC modulated using the filter method?	[5]