CBCS SCHEME

USN | | | | | | | | | | | 15EC45

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Principles of Communication System

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the generation of AM wave using switching modulator and show the output of the switching modulator is $V_2(t) = \frac{A_c}{2}\left[1 + \frac{4}{\pi A_c} m(t)\right]\cos(2\pi f_c t)$. **(06 Marks)**

b. Calculate the percent power saving for a DSB-SC signal for the percent modulation of (i) 100% (ii) 50%. **(04 Marks)**

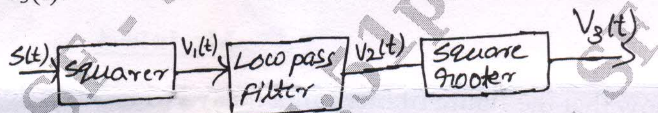
c. With a block diagram explain how downward and upward frequency translation is achieved. **(06 Marks)**

OR

2 a. Explain the operation of the ring modulator circuit which generates the DSB-SC waves. **(06 Marks)**

b. The AM signal $S(t) = A_c[1 + K_a m(t)] \cos 2\pi f_c t$ is applied to the system shown in Fig.Q.2(b). Assuming that $|k_a m(t)| < 1$ for all t and the message signal m(t) is limited to the interval $-w \le f \le w$, and the carrier frequency $f_c > 2w$, show that m(t) can be obtained from the square-rooter output $v_3(t)$. **(04 Marks)**

Fig.Q.2(b)



c. What is vestigial sideband modulation? Explain the generation of VSB modulated signal and list the advantages. **(06 Marks)**

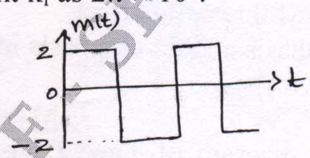
Module-2

3 a. With the help of block diagram. Explain the schemes for generating i) FM wave using PM ii) PM wave using FM. **(06 Marks)**

b. Explain non-linearity and its effect in FM system. **(06 Marks)**

c. Sketch the FM wave for the modulating signal m(t) as shown in Fig.Q.3(c). Assume frequency of 100MHz and constant k_f as $2\pi \times 10^5$. **(04 Marks)**

Fig.Q.3(c)



OR

4 a. Explain the generation of wide band FM wave using a voltage controlled oscillator. **(06 Marks)**

b. A 93.2 MHz carrier is frequency modulated by a 5kHz sine wave. The resultant FM signal has a frequency deviation of 40kHz. I) Find the carrier swing of the FM wave ii) What are the highest and lowest frequencies attained by the frequency modulated signal iii) Find the modulation index. **(04 Marks)**

c. Draw the linear model of phase locked loop and show that the resulting output signal of the PLL is approximately equal to $v(t) = \frac{K_f}{K_v} m(t)$. **(06 Marks)**

Module-3

5 a. Explain mean, correlation and covariance. **(06 Marks)**

b. List the properties of autocorrelation function. **(04 Marks)**

c. A TV receiving system is as shown in the Fig.Q.5(c). A preamplifier is used to overcome the effect of the Lossy cable. Typical values of the parameters are shown.

i) Find the overall noise figure of the system.

ii) Find the overall noise figure if the preamplifier is omitted. **(06 Marks)**

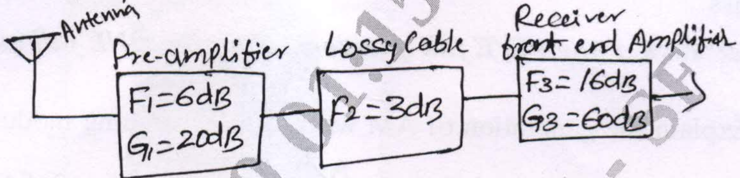


Fig.Q.5(c)

OR

6 a. What is probability density function? Show that the area under the PDF curve is equal to one. **(06 Marks)**

b. Consider the random variable X defined by probability density function

$$f_x(x) = \begin{cases} k & \text{a constant for } 2 \le x \le 4 \\ 0 & \text{elsewhere} \end{cases}$$

Determine : i) The constant K ii) $F_X(x)$. **(04 Marks)**

c. What is noise equivalent bandwidth? Show that noise equivalent band width for RC low pass filter is $\frac{1}{4RC}$. **(06 Marks)**

Module-4

7 a. Show that the figure of merit of a noisy FM receiver for single tone modulation is $\frac{3}{2}\beta^2$. **(08 Marks)**

b. Show that the figure-of-merit for DSB-SC receiver system is unity. **(08 Marks)**

OR

8 a. An AM receiver operating with a sinusoidal modulating signal has the following specifications. $\mu = 0.8$, $[SNR]_0 = 30$dB. What is the corresponding carrier-to-noise ratio? **(06 Marks)**

b. Briefly discuss FM threshold effect. **(04 Marks)**

c. Explain pre-emphasis and de-emphasis in frequency modulation system. **(06 Marks)**

Module-5

9 a. Draw the block diagram of Time Division Multiplexing system and explain the working principle of operation. **(08 Marks)**

b. Explain the generation of Pulse Position Modulation (PPM) system. **(08 Marks)**

OR

10 a. List the two operations involved in the generation of PAM [Pulse Amplitude Modulation] and explain how message signal m(t) is recovered from PAM. **(08 Marks)**

b. Discuss briefly quantization noise and show the output signal-to-noise ratio of a uniform quantizer is $[SNR]_0 = \left[\frac{3P}{m^2 \max}\right] 2^{2R}$. **(08 Marks)**

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