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B. E. (Fourth Semester) Examination ~~2020~~
APR-MAY 2022
(New Scheme)

(Electronics and Telecommunication Branch)

ANALOG COMMUNICATION

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Attempt all questions. Part (a) is compulsory and carries 2 marks each. Attempt any* ***two*** *parts from (b), (c) and (d) of each question and carries 7 marks each. All questions carry equal marks.*

Unit-I

1. (a) Explain the need of modulation briefly.

(b) The Signal $m(t)$ in the DSB-SC Signal

$$v(t) = m(t)\cos(\omega_c t + \theta)$$

is to be reconstructed by multiplying $v(t)$ by a signal derive from $v^2(t)$.

(i) Show that $v^2(t)$ has a component at the frequency $2 f_c$. Find its amplitude.

(ii) If $m(t)$ is band limited to f_m and has a probability density,

$$f(m) = \frac{1}{\sqrt{2\Pi}} e^{-m^2/2} \quad -\infty \leq m \leq \infty$$

Find the value of the amplitude of the component of $v^2(t)$ and $2 f_c$.

(c) Explain the working of super heterodyne receiver with neat block diagram.

(d) Explain envelop detector with neat and clean diagram.

Unit-II

2. (a) Explain Carsons rule of bandwidth.

(b) A Carrier is frequency modulated with a sinusoidal with a sinusoidal signal of 2 kHz, resulting in, maximum frequency deviation of 5 kHz.

(i) Find the bandwidth of a modulated signal.

(ii) The amplitude of the modulating sinusoid is increased by a factor of 3, and its frequency is lowered to 1 KHz. Find the maximum frequency deviation and the bandwidth of the new modulated signal.

(c) Explain with the help of block diagram of Armstrong modulation system.

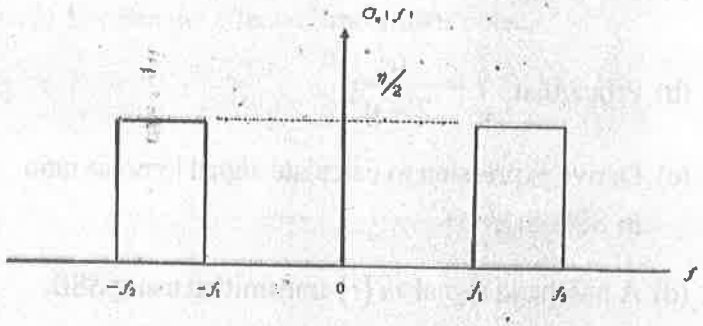
(d) Explain Filter method of SSB-Generation.

Unit-III

3. (a) Show that $E[\, a_k b_k \,] = 0$.

(b) Explain effects of linear filtering on noise for R-C low pass filter and ideal low pass filter only.

(c) The two-sided power spectral density of noise $n(t)$ shown in below figure.



(i) Plot the power spectral density of the product $n(t) \cos 2\Pi f_1 t$.

(ii) Calculate the normalized power of the product in the frequency range $-(f_2 - f_1)$ to $(f_2 - f_1)$.

(d) Gaussian noise $n(t)$ of zero mean has a power spectral density

$$\left\{ \begin{array}{ll} G_n(f) = 2\,\mu V^2 / Hz & |f| \leq 1 \text{ kHz} \\ G_n(f) = 0 & \text{elsewhere} \end{array} \right\}$$

(i) What is the normalized power of the noise?

(ii) Write the probability density function $f(n)$ of the noise.

Unit-IV

4. (a) Define figure of merit.

(b) Prove that, $\gamma = \dfrac{\mu^2}{2 + \mu^2}$

(c) Derive expression to calculate signal to noise ratio in SSB-SC.

(d) A baseband signal $m(t)$ transmitted using SSB.

Assume that the power spectral density of $m(t)$ is :

$$G_m(f) = \left\{ \begin{array}{ll} \dfrac{\eta_m |f|}{2 f_m} & |f| < f_m \\ 0 & |f| > f_m \end{array} \right\}$$

(i) The input signal power.

(ii) The output signal power.

Unit-V

5. (a) Define noise in FM receiver.

(b) Calculate figure of merit of frequency modulation system.

(c) Explain the need of pre-emphasis and De-emphasis in FM system.

(d) Explain the effect of transmitter noise.