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Question Paper Code: 71729

B.E./B.Tech. DEGREE EXAMINATION, APRIL / MAY 2017

Fourth Semester

Electronics and Communication Engineering

EC 6402 – COMMUNICATION THEORY

(Regulations 2013)

Time: Three Hours **Maximum: 100 Marks**

Answer All Questions

PART – A (10 X 2 = 20 Marks)

1. Do the modulation techniques decide the antenna height?
2. Define carrier swing?
3. State the Carson's rule?
4. Distinguish the feature of Amplitude modulation (AM) and Narrow band frequency modulation (NBFM)
5. List the necessary and sufficient conditions for the process to be WSS.
6. State wiener Khintchine theorem?
7. Specify the causes of threshold effect in AM system?
8. Comment the role of pre-emphasis and de-emphasis circuit in SNR improvement?
9. State the properties of Entropy?
10. What is the Shannon's limit

PART – B (5 X 13 = 65 Marks)

11. a. i. Derive an expression for output voltage of a Balanced Modulator to generate DSB-SC and explain its working principles.

ii. Discuss the detection process of DSB-SC and SSB-SC using coherent detector. Analyze the drawback of the suggested methodology.

Or

b. i. Comment the choice of IF selection and image frequency elimination.

ii. Elucidate the working principle of super heterodyne receiver with the neat block diagram.

12. a. i. Obtain the mathematical expression for WBFM. Also compare and contrast its Characteristics with NBFM.

ii. Suggest and discuss the method for the generation of FM using direct method

Or

b. i. Analyze and brief how the ratio detector suppresses the amplitude variation caused by the communication media without using amplitude limiter circuit.

ii. Explain the detection of FM wave using PLL detector

13. a. Consider two linear filters connected in cascades shown in fig 1. Let X (t) is a stationary process with a autocorrelation function $R_x(\tau)$, the random process appearing at the first input filter is V (t) and the second filter output is Y (t).

i. Find the auto correlation function of Y (t)

ii. Find the cross correlation function $R_{xy}(\tau)$ of V (t) and Y (t)

(or)

b. The amplitude modulated signal is defined as XAM (t) = A m (t) cos (ω_c t + θ) where m (t) is the baseband signal and A cos (ω_c t + θ) is the carrier. The baseband m (t) is Modeled as the zero mean stationary random process with the autocorrelation function Rxx (τ) and the PSD Gx (f). the carrier amplitude A and the frequency ωc are assumed to be constant and the initial carrier phase θ is assumed to be a random uniformly Distributed in the interval (-π, π), Furthermore, m (t) and θ are assumed to be Independent. Find PSD of X_{AM} (t)

14. a. i. Classify the different noise sources and its effect in real time scenario.

ii.Discuss the effect of noise in cascaded system

(or)

b. Derive an expression for signal to noise ratio for an AM signal, with assumption that the noise added in the channel is AWGN, compare with performance with FM system.

15. a. i. Consider a binary memory less source X with two symbols x1 and x2 prove that H (X) is maximum when both x1 and x2 equiprobable.

ii.Given a telegram source having two symbols dot and dash. The dot duration is 3 times the dot duration. The probability of the dot's occurring is twice that of the dash and time between the symbols is 0.2 sec. calculating the information rate of the telegraph source.

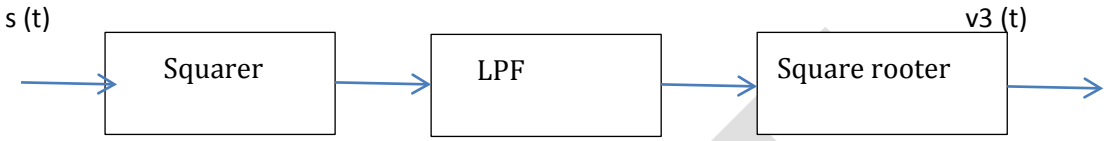
(or)

b. i. Find the channel capacity of the binary r = erasure channel.

ii. A source is emitting equiprobable symbols. Contract a Huffman code for source.

PART – C (1 x 15 = 15)

16. a. The AM signal s (t) = Ac [1+Ka m (t)] cos (2πfct) is applied to the system. Assuming that Ka m (t) < 1 for all t and the message signal m (t) is limited to the interval –W < f < W and that the carrier frequency fc > 2W show that m (t) can be obtained from the square rooter output v3 (t).



Consider a square law detector, using a non-linear device whose transfer characteristics is defined by $v2(t) = a1\ v1\ (t) + a2\ v1^2\ (t)$.

i. Evaluate the output v2 (t) and

ii. Find the condition for which the message signal m (t) may be recovered from v2 (t).

(or)

b. A Discrete Hilbert Transforms is a process by which signal's negative frequencies are Phase advanced by 90 degree and positive frequencies are phase delayed by 90 degree. Shifting the result of the Hilbert transform and adding it to the original signal creates a Complex signal as mentioned in the equation. If mi [n] is the Hilbert transform of mr [n]. Apply the concept of Hilbert transform to generate and detect SSB - SC signal.