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Question Paper Code : X 20444

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Fourth Semester
Electronics and Communication Engineering
EC 6402 – COMMUNICATION THEORY
(Regulations 2013)
(Common to : PTEC 6402 – Communication Theory for B.E. (Part-Time) – Third Semester – Electronics and Communication Engineering – (Regulations – 2014)

Time : Three Hours Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. Draw the AM modulated wave for modulation index = 0.5 and its spectra.

2. Define heterodyning.

3. Compare amplitude and angle modulation schemes.

4. Write the Carson's rule.

5. State Central Limit Theorem.

6. Write Einstein – Wiener – Khintchine relation.

7. Give the definition of noise equivalent temperature.

8. Define capture effect in FM.

9. State the properties of entropy.

10. What is Shannon's limit ?

PART – B **(5×13=65 Marks)**

11. a) Derive the expression for amplitude modulated wave and explain any one method to generate and demodulate it.

(OR)

b) Derive the expression for DSB-SC AM. Explain a method to generate and detect it.

12. a) An angle modulated signal is described by
$X_c(t) = 10\cos[2\pi(10^6)t + 0.1\sin(10^3)\pi t]$.

i) Considering $X_c(t)$ as a PM signal with kp = 10, find m(t). **(7)**

ii) Considering $X_c(t)$ as a FM signal with kp = 10π, find m(t). **(6)**

(OR)

b) i) Explain with diagrams the generation of FM using direct method. **(7)**

ii) With the phasor representation explains the foster seeley discriminator. **(6)**

13. a) Consider two linear filters connected in cascade as shown in Fig. 13(a). Let X(t) be 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). **(13)**

i) Find the autocorrelation function of Y(t)

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

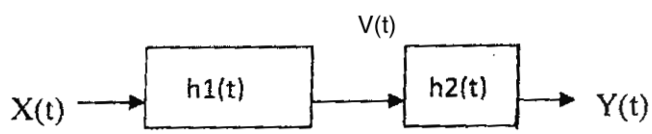

Fig. 13 (a)

(OR)

b) The amplitude modulated signal is defined as $X_{AM}(t) = A\,m(t)\cos(\omega_c t + \theta)$ where m(t) is the baseband signal and $A\cos(\omega_c t + \theta)$ is the carrier. The baseband signal m(t) is modeled as a zero mean stationary random process with the autocorrelation function $R_{xx}(\tau)$ and the PSD Gx(f). The carrier amplitude A and the frequency ω_c 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. **(13)**

i) Show that $X_{AM}(t)$ is Wide Sense Stationary

ii) Find PSD of $X_{AM}(t)$.

14. a) i) Define Narrow band noise and explain the representation of Narrow Band Noise in terms of In-Phase and Quadrature Components. **(7)**

ii) Explain Pre-emphasis and De-emphasis in FM. **(6)**

(OR)

b) Explain the noise in DSB-SC receiver using synchronous or Coherent detection and calculate the figure of merit for a DSB-SC system.

15. a) i) The two binary random variables X and Y are distributed according to the joint PMF given by $P(X = 0, Y = 1) = 1/4$; $P(X = 1, Y = 1) = 1/2$; $P(X = 1, Y = 1) = 1/4$; Determine $H(X, Y)$, $H(X)$, $H(Y)$, $H(X/Y)$ and $H(Y/X)$. **(8)**

ii) Define entropy and plot the entropy of a binary source. **(5)**

(OR)

b) Explain the Huffman coding algorithm with a flow chart and illustrate it using an example.

PART – C **(1×15=15 Marks)**

16. a) With neat circuit diagrams of pre-emphasis and de-emphasis circuits, justify its uses in FM System. **(15)**

(OR)

b) Draw an envelope detector used for demodulation of AM and explain its operation. **(15)**
