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MODEL QUESTION PAPER

V SEMESTER

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

EC332 – COMMUNICATION THEORY AND SYSTEM

Time: 3hrs **Max Marks: 100**

Answer all Questions

PART – A (10 x 2 = 20 Marks)

1. Suggest one application for AM, SSB, DSB and VSB modulation techniques and justify your answer.
2. When a signal $m(t) = 3 \cos (2\pi \times 10^3 t)$ modulates a carrier $c(t) = 5 \cos (\pi \times 10^6 t)$, find the modulation index and transmission bandwidth if the modulation is AM.
3. Distinguish between Narrowband and Wideband FM.
4. A 15 KHz audio signal is frequency modulated with modulation index= 5.Calculate the transmission bandwidth of FM Signal.
5. What do you understand by additive white Gaussian Noise? Explain.
6. Define Noise figure and Noise Temperature.
7. Discuss the factors that influence the choice of intermediate frequency in a radio receiver.
8. What is meant by FM Threshold? Explain.
9. Define entropy of a discrete memory less source emitting K symbols.
10. State channel capacity theorem and Explain.

PART – B (5 x 16 = 80 Marks)

11.i) An RF Communication system has a channel power loss of the 80dB and $No = 10^{-14}$ W/Hz. The base band message signal has the bandwidth of 5MHz and a uniform amplitude distribution in the interval ±2 Volts. Calculate the transmitter power required for $SNR_o = 40dB$ when the modulation is (a) SSB (b) AM with Ka = 0.8.

(ii) A sinusoidal message signal of frequency 1000Hz is used as modulating signal in FM and AM systems. The unmodulated carrier amplitude is the same in both systems. The peak frequency deviation of the FM system is set to 4 times the bandwidth of the AM system. The magnitude of the spectral components at fc±1000Hz are equal for both systems. Determine the modulation index of AM and FM systems.

12.a) Describe the square law method of generating AM signal and envelope detector for demodulation.

(OR)

12.b) Explain ring modulator for DSB signal generation and phase shift method for SSB signal generation.

13.a) Show that spectrum of a single tone FM wave is

(i) $S(f) = Ac/2 \sum_{n=-\infty}^{n=\infty} Jn(\beta)\ [\delta(f - f_c - nf_m) + \delta(f + f_c + nf_m)]$ where the symbols have the usual meaning.

ii) Draw the tone modulated line spectrum with $\beta=2$ for the above and comment about the transmission bandwidth.

(OR)

13.b) Show how a narrow band noise can be represented as $n(t) = n_c(t)\cos\omega_c t - n_s(t)\sin\omega_c t$ where $n_c(t)$ and $n_s(t)$ are the in-phase and quadrature phase components of noise respectively.

14.a) Derive an expression for the output SNR of an FM receiver and hence obtain the figure of merit.

(OR)

14.b)i) Show that the figure of merit of an AM receiver is $K_a^2P_m/(1+ K_a^2P_m)$, where the symbols denote the usual meaning.

ii) Distinguish between Coherent and non – coherent reception.

15.a)i) Show that the joint entropy $H(X,Y) = H(X) + H(Y/X)$

ii) Find the joint entropy and redundancy of a source producing 4 symbols A, B, C and D, which are related with the following probabilities.

i	A	B	C	D
P(i)	0.3	0.2	0.4	0.1

P(j/i)		j		
		A	B	C
i	A	0	0.8	0.2
	B	0.5	0.5	0.0
	C	0.5	0.4	0.1

OR

15.b)i) Explain and obtain an expression for mutual information and hence define the capacity of discrete noisy channel. Also derive the capacity of Binary symmetric channel.

ii) Encode the following source using Huffman procedure and find the coding efficiency.