

(Following Paper ID and Roll No. to be filled in your Answer Book)

Paper ID : 131522

Roll No.

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B.Tech.

(SEM. V) THEORY EXAMINATION, 2015-16

PRINCIPLES OF COMMUNICATION

[Time:3 hours]

[Maximum Marks:100]

Section-A

1. Attempt **all** parts. All parts carry equal marks. Write answer of each part in short. (2×10=20)
- (a) Draw the Block diagram of DSB synchronous demodulation system.
 - (b) List the disadvantages of SSB modulation scheme.
 - (c) Draw the block diagram of NBFM generation system.
 - (d) Mention the ideal bandwidth of the FM systems. What are the criteria of Carson's bandwidth calculation?
 - (e) What is the Nyquist sampling interval for the signal

$$x(t) = \text{sinc}(700t) + \text{sinc}(500t)$$

- (f) Write the expression for μ -Law compander.
- (g) What is the main advantage of using DPCM scheme?
- (h) Prove that the quantization noise in case of Delta Modulation with step size 'S' will be given by:

$$N_q = \frac{S^2}{3}$$

- (i) Consider an FM broadcast system with parameter $\Delta f = 75 \text{ KHz}$ and $B = 15 \text{ KHz}$. Assuming $S_x = \frac{1}{2}$, find the output SNR and calculate the improvement (in dB) over the baseband system.
- (j) For an amplifier with an output signal voltage of 4 V, an output noise voltage of 0.005 V, and an input and output resistance of 50Ω , determine the signal to noise power ratio.

Section-B

Attempt **any five** questions from this section. (10×5=50)

2. Discuss the importance of modulation index m and demodulation process for conventional AM systems.

3. (i) A radio transmitter radiates 10 KW and carrier power is 8.5 KW. Calculate modulation index.
- (ii) A broadcast radio transmitter radiates 10KW, when the modulation Percentage is 60. How much of this as carrier power?
4. Describe the operation of Phase discriminator FM demodulator.
5. An angle modulated signal with carrier frequency $\omega_c = 2\pi \cdot 10^5 \text{ rad/sec}$ is given by:
- $$\phi_{FM}(t) = 10 \cos(\omega_c t + 5 \sin 3000t + 10 \sin 2000t)$$
- i) Find the power of the modulated signal.
- ii) Find the maximum frequency deviation.
- iii) Find the maximum phase deviation.
- iv) Estimate the bandwidth of FM signal.
6. Draw the line coding scheme of bit stream 01101001 as per the (a) Unipolar NRZ (b) Polar NRZ signaling (c) Unipolar RZ signaling (d) Bipolar RZ signaling (d) Split-Phase of Manchester code.
7. What are the noise considerations in PCM? Explain the TDM PAM concept.

8. Explain the differential Pulse Modulation Scheme in detail.
9. Discuss the brief Delta Modulation. Also comment on Vocoders used in voice transmission.

Section-C

Attempt **any two** questions from this section. (15×2=30)

10. Explain the terms Wide Sense Stationary (WSS) and Power Spectral Density (PSD).
11. Show that the equivalent noise bandwidth of a low pass filter is 1.57 time of its 3dB bandwidth F_{3dB} .
12. Quantify the noise performance of Frequency Modulation in detail. Draw the concerned phase diagrams in support of your answer. Prove the relationship:

$$SNR_{FM} = 3\beta^2 \frac{P}{m_p} SNR_{baseband}$$

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