

III B.Tech II Semester Supplementary Examinations, Aug/Sep 2007
COMMUNICATION ENGINEERING
(Electronics & Instrumentation Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) An AM transmitter has antenna current of 2A with modulation index of 60 percent. What will be the total antenna current if one more identical antenna is connected in parallel with the previous one, keeping the transmitter output same? Will it affect the modulation index?
(b) An audio frequency signal $10 \sin(2\pi \times 500t)$ is used to amplitude modulate a carrier of $50 \sin 2\pi 10^5 t$. Calculate
 - i. Modulation index
 - ii. Side band frequencies
 - iii. Amplitude of each side band frequencies
 - iv. Bandwidth required
 - v. Total power delivered to the load of 600 ohms
 - vi. Transmission efficiency. [8+8]
2. (a) In an Armstrong Modulator the crystal oscillator frequency is 200 KHz. It is desired in order to avoid distortion to limit the maximum angular deviation to $\phi_m = 0.2$. The system is to accommodate modulation frequencies down to 40Hz. At the output of the modulator the carrier frequency is to be 108 MHz and the frequency deviation 80KHz. Select multiplier and mixer oscillator frequencies to accomplish this.
(b) Explain the effect of random noise on the output of an FM receiver fitted with amplitude limiter. Develop the concept of noise triangle. [8+8]
3. (a) Write about the classification of transmitters.
(b) Draw the block diagram of Amplitude modulated transmitter and explain the functions of each block. [8+8]
4. (a) Draw a block diagram of a typical AM receiver and describe briefly function of each block.
(b) Explain the necessity for:
 - i. Tone and volume control
 - ii. Alignment and tracking in radio receiver What is meant by spurious response of a receiver? [8+8]
5. (a) Discuss the various sources of noise encountered in signal communication.

- (b) The first stage of two stage amplifier has output resistor of $25\text{ K}\Omega$, voltage gain of 10, input resistor of 600Ω and equivalent noise resistance of 2400Ω . The second stage has output resistor of $300\text{ K}\Omega$, voltage gain of 22, input resistor of $100\text{ K}\Omega$ and equivalent noise resistance of $8\text{ K}\Omega$. The amplifier is driven by a generator of output impedance 50Ω . Compute for this two stage amplifier
- i. equivalent input noise resistance
 - ii. equivalent input noise voltage given that the bandwidth of the amplifier is 10 kHz and the ambient temperature is 330 K and
 - iii. noise figure. [8+8]
6. (a) What is the fundamental difference between Pulse modulation schemes and frequency and amplitude modulation schemes.
- (b) Explain the generation and demodulation of pulse width modulation. [8+8]
7. (a) Draw the block diagram of binary PSK receiver and explain the working principle.
- (b) Write the difference between coherent and non-coherent systems. Give example. [8+8]
8. A Data source produces 8-bit ASCII Characters. Derive an expression for the maximum data rate (rate of ASCII data bits) over a B-bps line for the following.
- (a) A synchronous transmission with a 1.5 unit stop bit.
 - (b) Synchronous transmissions, with a frame consisting of 48 control bits and 128 information bits, The information field contains 8 bit ASCII characters.
 - (c) Same as (b), but with an information field of 1024 bits [5+5+6]

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1. (a) Explain the Costas loop with the block diagram.
(b) Explain the ring modulator for generation of DSB-SC. [8+8]
2. (a) Distinguish between phase and frequency modulation. Show that FM can be derived using PM and vice versa with the help of differentiator or integrator networks.
(b) Compute the bandwidth requirement for the transmission of FM signal having a frequency deviation 75 KHz and an audio bandwidth of 10KHz.
(c) In a FM system the frequency deviation constant is 1KHz/V. A sinusoidal modulating signal of amplitude 15 V and frequency 3 MHz is applied, Calculate
 - i. Peak frequency deviation
 - ii. Modulating index. [6+4+6]
3. (a) Explain the requirements of carrier frequency for a radio transmitter.
(b) Explain the operation of amplitude modulated transmitter using modulation at high carrier power level . [8+8]
4. (a) Explain the necessity for AGC in a radio receiver.
(b) Discuss the consideration that governs the choice of IF in a receiver.
(c) Explain the operation of superheterodyne receiver. [5+5+6]
5. (a) Calculate the mean squared noise voltage at the terminals of RC circuit.
(b) Write about noise figure and obtain the relation between noise figure and equivalent noise temperature of a cascaded network. [6+10]
6. (a) Plot the spectrum of a PAM wave produced by the modulating signal $m(t) = A_m \cos(2\pi f_m t)$ assuming a modulation frequency 0.25Hz, sampling period $T_s = 1s$, and pulse duration $T = 0.45s$.
(b) Discuss the system for recovering message signal from PAM signal. [8+8]
7. (a) Discuss the noise considerations in PCM. Give the influence of E_b/N_0 on the probability of error.
(b) Discuss the applications of M-ary modulation schemes. [8+8]
8. (a) What is the most prominent serial interface in the united states? Why?

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(b) Why did the EIA establish the RS-232 interface?

(c) Explain EIA RS-232 pin functions?

[5+5+6]

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 - i. Peak frequency deviation
 - ii. Modulating index. [6+4+6]
3. (a) Explain the operation of ISB transmitter with block diagram. Where it is used?
(b) What is the function of crystal filters in SSB transmitter?
(c) State and explain with respect to 'Q', various types of filters used to separate side bands? [4+6+6]
4. (a) What is simple automatic gain control? What are its functions? What is delayed AGC and what are its merits compared to simple AGC?
(b) Discuss the considerations in the choice of I.F. and the design of I.F. stage. [8+8]
5. (a) Explain the phenomena of fading in detail.

- (b) Describe different diversity reception techniques including the MUSA system to combat fading. [8+8]
- 6. (a) What is the fundamental difference between Pulse modulation schemes and frequency and amplitude modulation schemes.
(b) Explain the generation and demodulation of pulse width modulation. [8+8]
- 7. Draw the block diagrams of Adaptive Delta Modulation transmitter and receiver, and explain the operation. [16]
- 8. (a) Explain the difference in circuit, message and packet-switching techniques?
(b) What is blocking? With which switching techniques is blocking possible? Explain [8+8]

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(b) Explain the effect of random noise on the output of an FM receiver fitted with amplitude limiter. Develop the concept of noise triangle. [8+8]
3. (a) In an AM radio transmitter you can have modulation at low level or at the final PA stage. Explain briefly both methods & compare their merits.
(b) Why is frequency stability of a transmitter is important. Explain one method to obtain good stability. [8+8]
4. (a) Draw a block diagram of communication receiver and describe the working of simple squelch system.
(b) Explain the principle of diversity reception techniques. [10+6]
5. (a) Calculate the shot noise component of current present on a direct current of 1 mA flowing across a semiconductor junction, given that the effective noise band width of 1 MHz.
(b) Explain how thermal noise power varies
 - i. with temperature and

- ii. with frequency bandwidth. [8+8]
6. (a) What is Pulse Modulation? Classify pulse modulation systems.
(b) State and explain Sampling Theorem. [8+8]
7. (a) Illustrate the Delta modulation with neat diagram.
(b) Illustrate the two different forms of quantization error in delta modulation. [8+8]
8. (a) What is the difference between a primary and a secondary channel in a modem.
(b) Compare the mechanism of a space division switch to the mechanism of a time division switch.
(c) What is the limiting factor in a cross bar switch? How does a multistage switch alleviate the problem? [6+4+6]
