Code No: RR221102 **Set No. 1**

II B.Tech II Semester Regular Examinations, Apr/May 2006
COMMUNICATION ENGINEERING
(Bio-Medical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What are advantages and disadvantages of AM over FM.
   (b) The single-tone modulating wave m(t) $=A_m \cos 2\pi f_m t$ is used to generate the following Vestigial Side Band modulated wave
   $s(t) = aA_mA_c\cos[2\pi(f_c+fm)t] + A_mA_c(1-a)\cos[2\pi(f_c-f_m)t]$ where a is a constant. Find the in-phase and quadrture components of the VSB modulatd wave. For what value of constant 'a', s(t) reduces to a DSB-SC modulated wave. [8+8]

2. (a) With a neat circuit diagram explain the principle of operation of "reactance modulator". Derive the expression for equivalent reactance offered by the circuit. Discuss how it can be used for generating FM wave.
   (b) Explain why heterodyning does not vary the frequency deviation ratio of a FM signal but frequency multiplication does. [8+8]

3. (a) How is stereo FM able to efficiently transmit twice the information of a standard FM broadcast using the same bandwidth.
   (b) Explain the circuit arrangement for FM generation using IC566. [8+8]

4. List the distinguishing features of communications receiver and draw the schematic. Explain briefly the operation of each where necessary, and show some of the more important circuits or block diagrams. [16]

5. (a) Derive Noise figure formula for cascaded network
   (b) A mixer circuits has a noise figure of 12 dB. It is preceded by an amplifier that has an equivalent noise temperature of 200 K and a power gain of 30 dB. Calculate the equivalent noise temperature of the combination referred to the amplifier input. [8+8]

6. (a) What is Pulse-width Modulation? What other names does it have? How is it demodulated?
   (b) Distinguish between Natural and flat-top Sampling.
   (c) Explain the principle of basic transistor PAM modulator with a circuit.[8+4+4]

7. (a) Draw the block diagram of PCM system and explain in detail the functions of each block.
   (b) In what way it differs to other pulse modulation methods. [10+6]

8. Assuming a synchronous transmission control scheme, explain how character and frame synchronization are achieved

   (a) with character oriented transmission.

   (b) With bit oriented transmission. [8+8]

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1. (a) What are advantages and disadvantages of AM over FM.
   (b) The single-tone modulating wave m(t) $=A_m \cos 2\pi f_m t$ is used to generate the following Vestigial Side Band modulated wave
   $s(t) = aA_mA_c\cos[2\pi(f_c+fm)t] + A_mA_c(1-a)\cos[2\pi(f_c-f_m)t]$ where a is a constant. Find the in-phase and quadrture components of the VSB modulatd wave. For what value of constant 'a', s(t) reduces to a DSB-SC modulated wave. [8+8]

2. (a) Find the carrier and modulating frequencies, the modulating index and the maximum deviation of the FM wave represented by the equation
   $u(t) = 15\sin(6\pi 10^9 t + 6\sin 1350t)$ .What power will this FM wave dissipate in a 20-ohm resistor?
   (b) Derive the expression for the instantaneous value of an FM voltage and define modulation index and also expression for bandwidth. **[8+8]**

3. (a) Explain the operation of radio transmitter.
   (b) Why the first power amplifier in radio transmitter is called buffer amplifier?
   (c) What is the function of harmonic generator in radio transmitter
   (d) What are the contents of audio frequency channel in radio transmitter?[4+4+4+4]

4. (a) Differentiate between simple, delayed and amplified AGC and explain their action with the help of simple circuits blocks.
   (b) Discuss briefly similarities and differences between FM and AM receivers.
   (c) Write in detail about the limiter used in FM receiver. [6+6+4]

5. (a) Derive the expression for Noise Figure for an amplifier.
   (b) The first stage of a two-stage amplifier has a voltage gain of 10, a 600 Ω input resistor, a 1600 Ω equivalent noise resistance and 27 K Ω output resistor. For the second stage these values are 25, 81 kΩ, 10kΩ and 1MΩ respectively. Calculate the equivalent input-noise resistance of this two-stage amplifier. [8+8]

6. (a) Discuss the two different forms of pulse time modulation for the case of a sinusoidal modulating wave.
   (b) Discuss the features of pulse amplitude modulation. [10+6]

7. (a) Discuss the noise considerations in PCM. Give the influence of Eb/No on the probability of error.

(b) Discuss the applications of M-ary modulation schemes. [8+8]

8. (a) Show that bit pattern in an asynchronous transmission with one start and one stop bit if the data to be sent is "HELLO" using ASCII code.

(b) For the V124/EIA-232 remote loop back circuits to function properly, what circuits must be logically connected?

(c) The local loopback test tests the operation of the local DCE (modem). A Signal is sent from the local DTE to the local DCE and returned to the local DTE. Draw a figure and show which EIA-232 pins are used for this test? [5+6+5]

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1. (a) What are the disadvantages of SSB-SC over normal AM. And compare AM and FM.
   (b) Explain the frequency discrimination method for generating an SSB modulated wave. [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 ϕ_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) Explain the classification of radio transmitter based on the frequency range involved?
   (b) Explain the classification of radio transmitter based on the type of service involved? [8+8]
4. (a) Differentiate between simple, delayed and amplified AGC and explain their action with the help of simple circuits blocks.
   (b) Discuss briefly similarities and differences between FM and AM receivers.
   (c) Write in detail about the limiter used in FM receiver. [6+6+4]
5. Write notes on:
   (a) Fading and diversity reception.
   (b) Amplitude limiter. [8+8]
6. (a) What is Pulse-width Modulation? What other names does it have? How is it demodulated?
   (b) Distinguish between Natural and flat-top Sampling.
   (c) Explain the principle of basic transistor PAM modulator with a circuit.[8+4+4]
7. (a) Draw the block diagram of FSK transmitter and explain.
   (b) Draw the block diagram of non coherent receiver for the detection of binary FSK signals. [8+8]

8. (a) Explain the common - channel-signaling modes?

   (b) Consider a simple telephone network consisting of two end offices and one intermediate switch with a 1-MHz full-duplex trunk between each end office and the intermediate switch. The average telephone is used to make four calls per 8-hour workday, with a mean call duration of six minutes. Ten percent of the calls are long distance, what is the maximum number of telephones an end office can support? [8+8]

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2. (a) Explain clearly the difference between Amplitude, Frequency, and Phase modulations, beginning with the difinition of each type and the meaning of the modulation index in each case.
   (b) Explain with the block diagram the Armstron method of FM generation.[8+8]

3. (a) With a block diagram , explain the working of phase modulated FM transmitter?
   (b) Explain the working of frequency modulated transmitters using reactance tube modulators. [10+6]

4. (a) Differentiate between simple, delayed and amplified AGC and explain their action with the help of simple circuits blocks.
   (b) Discuss briefly similarities and differences between FM and AM receivers.
   (c) Write in detail about the limiter used in FM receiver. [6+6+4]

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 KΩ, voltage gain of 10, input resistor of 600Ωand equivalent noise resistance of 2400 Ω. The second stage has output resistor of 300 KΩ , voltage gain of 22, input resistor of 100 KΩ and equivalent noise resistance of 8 KΩ . The amplifier is driven by a generator of output impedance 50 Ω Computer 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) Draw the block diagram of TDM system. Discuss the applications of TDM.

(b) Discuss the effect of under sampling? [10+6]

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) Why FSK is not suitable for high speed modems.
   (b) Why are modems needed for telephone communications.
   (c) Explain the asymmetry of 56 k modems. [6+6+4]

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