

**III B.Tech I Semester Regular Examinations, November 2006**  
**COMMUNICATION ENGINEERING**  
**(Electronics & Control Engineering)**

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

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. (a) Suppose that the modulating signal  $m(t)$  is a sinusoidal of the form  $m(t) = \cos 2\pi f_m t$  where  $f_m \leq f_c$ . Determine the DSB-SC AM signal and its upper and lower side bands.  
(b) Calculate
  - i. the total power and
  - ii. the power in each side band frequency for a standard AM transmission that is sinusoidally modulated to a depth of 80%. If the un modulated carrier power is 50KW. [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) 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) Explain the principle of a simple Automatic Gain Control (AGC) of super heterodyne AM receiver.  
(b) What is the necessity for tracking in radio receivers? Explain briefly the tracking techniques used in radio receivers.  
(c) Write about separately excited mixer. [6+5+5]
5. (a) Define the terms
  - i. sensitivity,
  - ii. selectivity,
  - iii. fidelity and
  - iv. noise figure of a radio receiver.

- (b) Explain with a diagram, the procedure for measurement of the above.
- (c) Write about variable selectivity and sensitivity [8+4+4]
- 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 a Delta Modulation and explain its operation with waveform.
- (b) What is meant by Slope-overload error in Delta modulation? Explain. [8+8]
- 8. (a) Write the electrical specifications of RS-232 interface?
- (b) What is the primary difference between the RS-449 A interface and RS-232 interface.
- (c) Explain the CCITT X.21 standard? [6+5+5]

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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  $50 \sin 2\pi 10^5 t$  to 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 FM system, when the audio frequency (AF) is 500Hz and AF voltage is 2.4V, the deviation is 4.8 KHz. If the Af voltage is now increased to 7.2 V, What is the new deviation ? If the AF voltage is raised to 10V while the AF is dropped to 200Hz, what is the deviation? Find the modulation index in each case.  
(b) Draw the spectrum of FM wave and discuss about it in detail. [8+8]
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. Write short notes on the following:-
  - (a) Automatic Gain Control
  - (b) diode director
  - (c) Mixers [4+5+7]
5. (a) With suitable diagram explain how noise figure is measured.  
(b) The equivalent noise resistance for an amplifier is 300 ohms and the equivalent shot noise current is 5 micro amps. The amplifier is fed from a 150 ohms, 10 micro volts rms sinusoidal signal source. Calculate the individual noise

voltages at the input and the input signal to noise ratio in decibels. The noise bandwidth is 10 MHz. [8+8]

6. (a) Distinguish between PAM, PWM and PPM.  
(b) What is TDM? Distinguish between synchronous and asynchronous TDM. [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) The noise factor of a radio receiver is 15:1. Calculate its noise figure. Determine the output S/N ratio when the input S/N ratio to the receiver is 35 db.  
(b) The parallel tuned circuit at the input of a radio receiver is tuned to resonate at 120 MHz by a capacitance of 25 pF. The Q factor of the circuit is 30. The channel bandwidth of the receiver is limited to 10 KHz by the audio sections. Calculate the effective noise voltage appearing at the input at room temperature. [8+8]

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1. (a) Sketch the time domain and frequency domain representation of
  - i. carrier
  - ii. signal
  - iii. standard AM,
  - iv. DSB-SC and SSB-SC for single tone modulation.
- (b) Using the message signal  $m(t) = \frac{1}{1+t^2}$ . Determine and sketch the modulated waves for the following methods for modulation.
  - i. Amplitude Modulation with 50 percent modulation.
  - ii. Single side band with only the lower side band transmitted. [8+8]
2. (a) Explain the indirect method of FM generation.
- (b) A 500Hz modulating voltage fed into a PM generator produces a frequency deviation of 2.25KHz. What is the modulation index if the amplitude of the modulating voltage is kept constant but its frequency is raised to 6KHz? What is the new deviation? [8+8]
3. (a) How will you avoid side bands of one station overlapping with other radio station?
- (b) Write short notes on the following:-
  - i. Peak limiters
  - ii. Peak clippers
  - iii. Volume compressors in radio transmitters. [6+10]
4. (a) Discuss the factors influencing the choice of Intermediate frequency for a radio receiver.
- (b) Explain the operation of a self-excited transistor mixer by 3-frequency approach, with a neat diagram.
- (c) Write about double spotting. [6+6+4]
5. (a) Explain clearly the phenomenon of shot noise generation in active devices.
- (b) Derive expression for noise figure of a cascade system of amplifiers. [8+8]
6. (a) What is Pulse Modulation? Classify pulse modulation systems.
- (b) State and explain Sampling Theorem. [8+8]

7. Discuss the various encoding procedures in PCM. [16]
8. (a) What are the parallel interfaces? What is the difference between serial interface and parallel interface?
- (b) What is centronics parallel interface and Explain control, data and status lines for it? [8+8]

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1. (a) Explain the generation of DSB-SC signal for AM schemes. Illustrate the functional operation of the same circuit with suitable waveforms.  
(b) Explain the need for modulation. [10+6]
2. (a) Find the carrier and modulating frequencies, the modulating index and the maximum deviation of the FM wave represented by the equation  
 $u(t) = 15 \sin(6\pi 10^9 t + 6 \sin 1350 t)$ . 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.
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) Discuss in detail the various tracking techniques used for receivers.  
(b) A Superheterodyne receiver is to tune the range from 4-10 MHz, with an IF of 1.8 MHz. Calculate the range of oscillator frequencies, the range of image frequencies.  
(c) Write about image frequency. [5+6+5]
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) Distinguish between PAM, PWM and PPM.  
(b) What is TDM? Distinguish between synchronous and asynchronous TDM. [8+8]
7. (a) Discuss the bandwidth efficiency of M-ary digital modulation techniques.  
(b) Draw the signal space diagram of coherent QPSK system and explain. [8+8]

8. Write about signaling techniques and routing techniques for circuit-switched networks? [16]

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