Code No: RR220401 **Set No. 1**

II B.Tech II Semester Supplimentary Examinations, Apr/May 2008
COMMUNICATION THEORY
(Electronics & Communication Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Derive an expression for AM wave and draw its frequency spectrum.
   (b) Draw the one cycle of AM wave and calculate the modulation index of it in terms of V_{max} and V_{min} voltages.
   (c) A 500-W carrier is modulated to a depth of 80%. Calculate the total power in the modulated wave. [6+6+4]

2. (a) Explain with the help of block diagram the phase-shift method of sideband suppression.
   (b) Explain the operation of square law modulator. [8+8]

3. (a) What are the non-coherent methods of AM demodulation? Explain those clearly using suitable sketches and expressions.
   (b) With neat sketches, explain about the vestigial sideband (VSB) modulation system and mention its application(s). [9+7]

4. (a) A 500-Hz modulating voltage fed into a PM generator produces a frequency deviation of 2.25 KHz. What is the modulation index? If the amplitude of the modulating voltage is kept constant, but its frequency is raised to 6 KHz, what is the new deviation?
   (b) Explain the effect of multiple frequency modulations in FM System with an example. [8+8]

5. (a) Draw the schematic diagram for basic reactance modulator using FET and explain how this can be used as FM generator?
   (b) Explain with block diagram the Armstrong method of FM generation. [8+8]

6. Draw the practical circuit of a balanced ratio detector, and show how it is derived from the basic circuit. Explain the improvement effected by each of the changes. [16]

7. Explain the SNR's at Input and output of demodulators of DSB-SC and SSB-SC and compare them. [16]

8. (a) What is the purpose of pre-emphasis and de-emphasis filtering? Explain the filtering process with suitable sketches.
   (b) Draw the phasor diagram of signal and noise in an angle modulated system showing both the signal and noise components. [8+8]

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Code No: RR220401 **Set No. 2**

II B.Tech II Semester Supplimentary Examinations, Apr/May 2008
COMMUNICATION THEORY
(Electronics & Communication Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) An AM transmitter radiates 8KW with carrier unmodulated and 9KW when the carrier is sinusoidally modulated. Calculate the modulation index. If another sine wave, corresponding to 50% modulation, is transmitted simultaneously, determine the total radiated power.
   (b) What is Frequency Translation and discuss various methods of frequency translation techniques. [8+8]

2. (a) Explain the modulation of VSB wave using Filter method with neat block diagram and waveforms.
   (b) What does modulation actually do to a message and carrier? [10+6]

3. (a) Write notes on amplitude limiting in ratio detector.
   (b) Describe the detection of AM with carrier using Rectifier detector using neat waveforms. What are its drawbacks compared to Envelope detector. [7+9]

4. An angle modulated signal has the form u(t) = 100 cos [2π f_c t + 4 sin 2000πt] Where f_c = 10 MHz.
   (a) Determine the average transmitted power.
   (b) Determine the peak-phase deviation.
   (c) Determine the peak-frequency deviation.
   (d) Is this an FM or a PM signal? Explain. [4+4+4+4]

5. A carrier 100 cos 2 π 1×0t volts is frequency modulated by a signal 5 cos 2 π × 10^2t volts. The modulation index β is 0.3. The modulated wave is passed through a band pass filter whose transfer function is:

   H(f) = 0.5+0.25(f-9) when 9<f<11

   = 0 otherwise

   and frequency is in KHz.

   The filtered signal; is passed throughout an ideal envelope detector which is followed by an ideal low pass filter with cut off at 1.5 KHz. Find the signal power at the output of the low pass filter. Use the following values of Bessel functions wherever required. $J_0(0.3)$=0.99, $J_1(0.3)$=0.1, $J_2(0.3)$=0.01, $J_3(0.3)$=0.001, $J_4(0.3)$=0.0001. [16]

6. Using neat circuit diagram and relevant waveforms discuss how an FM signal can be detected using phase-discrimination method. What are its advantages and disadvantages? [16]

7. Explain the SNR's at Input and output of demodulators of DSB-SC and SSB-SC and compare them. [16]

8. Obtain the expression for SNR in the PM reception. [16]

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Code No: RR220401 **Set No. 3**

II B.Tech II Semester Supplimentary Examinations, Apr/May 2008
COMMUNICATION THEORY
(Electronics & Communication Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) A carrier wave of frequency 12MHz and the peak value of 12V is amplitude modulated by a 6KHz sine wave with amplitude of 6V. Determine
   i. Modulation index
   ii. Amplitude in each side bands
   iii. Frequency spectrum
   iv. Band width required.
   (b) Derive an expression for DSB-SC wave, if the message is $m(t)$ and carrier is $A_c \cos \omega_c t$. [9+7]

2. (a) How modulation can be achieved using non-linear characteristics of an active device and hence show the circuit diagram of Modulator.
   (b) Draw the schematic diagram of chopper type modulator. Hence, explain the generation of DSB-SC using the Ring Modulator. [8+8]

3. (a) Write notes on amplitude limiting in ratio detector.
   (b) Describe the detection of AM with carrier using Rectifier detector using neat waveforms. What are its drawbacks compared to Envelope detector. [7+9]

4. (a) Define Modulation Index in FM. Discuss the spectra of NBFM and WBFM for various Modulation Indices.
   (b) Derive equation for FM carrier from fundamentals. Also differentiate FM and PM. [7+9]

5. An RC capacitive reactance modulator is used to vary the frequency of a 10-MHz oscillator by ±100KHz. An FET whose trans-conductance varies linearly with the gate voltage from 0 to 0.625mS, is used in conjunction with a resistance whose value is one-tenth of the capacitive reactance used. Calculate the inductance and capacitance of the oscillator tank circuit. [16]

6. Draw the practical circuit of a balanced ratio detector, and show how it is derived from the basic circuit. Explain the improvement effected by each of the changes. [16]

7. (a) Explain the Signal-to-noise ratio (SNR) calculations for conventional AM.
   (b) Derive an expression for effect of noise on SSB AM system. [8+8]

8. Explain the effect of random noise on the output of FM demodulator filtered with an amplitude limiter. Develop the concept of noise triangle. [16]

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Code No: RR220401 **Set No. 4**

II B.Tech II Semester Supplimentary Examinations, Apr/May 2008
COMMUNICATION THEORY
(Electronics & Communication Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the two methods for calculation of total modulation index, when the carrier is modulated by more than one modulating signal.
   (b) What is VSB, where it is used? Explain its advantages and disadvantages over SSB. [8+8]

2. (a) Draw the block diagram of the square law modulator and explain its operation with the help of waveforms.
   (b) Write short notes on VSB generation. [8+8]

3. (a) Explain the principle and operation of "slope Detector".
   (b) Give the block diagram for coherent detection of DSB-SC modulated wave and explain the operation of it. Explain the process of frequency translation. [7+9]

4. (a) A 25-MHz carrier is modulated by a 400-Hz audio sine wave. If the carrier voltage is 4V and the maximum deviation is 10 KHz, write the equation of this modulated wave for
      i. FM and
      ii. PM.
      If the modulating frequency is now changed to 2 KHz, all else remaining constant, write a new equation for
      iii. FM and
      iv. PM.
   (b) Explain, how the bandwidth in FM is calculated. [12+4]

5. Explain the generation of FM signals
   (a) Indirect method
   (b) Direct methods. [8+8]

6. Explain the phase discrimination method of detection of FM signal. Using phasor diagrams obtain the discriminator response. What are its advantages and disadvantages?

   16]

7. A noise signal with a power density spectrum $S_n(\omega)$ is shown in figure 7 is transmitted through an ideal band pass filter shown in figure 7 . Express the output signal. [16]

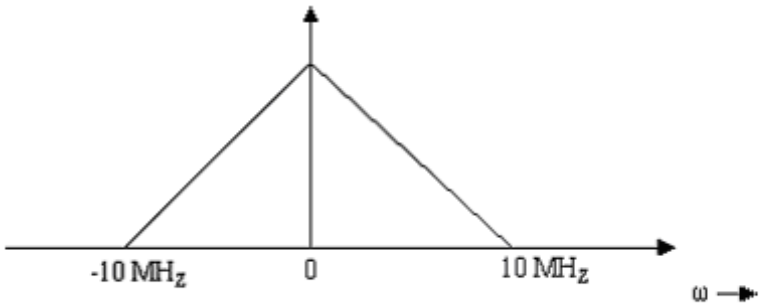

Figure 7

Figure 7

8. What are the observations made from the signal to noise ratio (SNR) expressions of FM system? Explain them in detail. What do you know about the threshold extension in FM? [16]

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