M.E. Sem I (Rev.) Communication Theory. 30/12/08

VT Oct. 08-318 Etrx.

Con. 5897–08. (REVISED COURSE) BB–8204

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Assume **suitable** data if **required**, stating them clearly.

1. (a) What is the function of AGC in a radio reciever ? Explain how simple AGC can be emplemented with a diode detector. **20**
   (b) The bandwidth of an FM system is a function of the modulation index. Justify.
   (c) Why is differential coding employed in PSK systems ?
   (d) Distinguish between orthogonal FSK and non-orthogonal FSK.

2. (a) An AM transmitter with a carrier power of 10 W at a frequency of 25 MHz operates into a 50 ohm load. It is modulated at 60% by a 2 KHz sine wave. **8**
      (i) Sketch the signal in frequency domain (Power Vs. Frequency)
      (i) What is the total signal power ?
      (ii) What is the RMS voltage of the signal ?
   (b) Explain Rectifier distortion and Diagonal clipping with respect to AM diode detector. Illustrate the same with suitable waveforms. **6**
   (c) A carrier of frequency 10^6 Hz and amplitude 3 volts is frequency modulated by a sinusoidal modulating waveform of frequency 500 Hz and of peak amplitude 1 volt. As a consequence, the frequency deviation is 1 KHz. The level of the modulating waveform is changed to 5 volts peak and the modulating frequency is changed to 2 KHz. Write the expression for the new modulated waveform. **6**

3. (a) Derive and sketch the spectrum of a flat top sampled signal. Hence explain Aperture Effect Distortion. **8**
   (b) With suitable waveforms, explain slope overload error in Linear Delta Modulation system. Obtain the expression giving constraints on the amplitude and frequency for a sinusoidal input to avoid slope overload. **6**
   (c) Twenty four analog signals each having bandwidth of 15 KHz are to be time division multiplexed and transmitted via PAM. A guard band of 5 KHz is required for signal reconstruction from the PAM samples of each signal :– **6**
      (i) Determine the sampling rate of each signal
      (ii) Determine the transmission bandwidth
      (iii) Draw the functional block diagram of transmitter and reciever.

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4. (a) (i) Draw the block diagram of DEPSK system (transmitter and receiver). 8
(ii) If the input bit stream is d(t) = 001010011010, obtain the differential encoder output, b(t)
(iii) Obtain expressions at the output of each block in the reciever and show that the data d(t) is recovered.
(iv) With the data from (ii) show that if the fourth bit in b(t) is in error, then the fourth and fifth data bits in d(t) will also be in error.
(b) For data d(t) = 011001010101, sketch MSK waveform. 8
(c) Distinguish between coherent and non-coherent detection. 4

5. For an orthogonal BFSK system :–
(a) Sketch transmitter and reciever block diagrams for coherent and non-coherent detection. 6
(b) From the BFSK expression, derive signed space representation and obtain Euclidian distance. 6
(c) Derive the expression for power spectrol density. Sketch the power spectral density and hence obtain bandwidth. 8

6. (a) Sketch duobinary signalling encoder. 2
(b) Derive the transfer function of a Duobinary conversion filter and hence plot magnitude and phase response. 6
(c) A binary source generates digits 1 and 0 randomly with equal probability. Assign probabilities to the following events. In ten digits generated by the source. 6
(i) There are exactly two 1's and eight 0's.
(ii) There are atleast four 0's.
(d) The input to a matched filter is a rectangular pulse of amplitude A and duration T. Obtain the impulse response h(t) of the matched filter. Also obtain the output of the matched filter in response to the above input signal. What is the peak value of the output and when does it occur ? 6

7. Write notes on any **four** :– 20
(a) Offset QPSK
(b) PCM system with compounding
(c) Cosine filter impulse response
(d) FDM hierarchy
(e) Properties of probability density function.

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