Code No: NR310405 **NR**

III B.Tech I Semester Supplementary Examinations, November 2005
DIGITAL COMMUNICATIONS
(Common to Electronics & Communication Engineering and Electronics & Telematics)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) With neat diagrams, explain the principle of working a sample and hold circuit. List out its applications. [8]
   (b) Show that $\sum_{R=-\infty}^{\infty} x(RT_s) = f_s \sum_{n=-\infty}^{\infty} X(nf_s)$, where x(t) is a signal band limited to f_1 , X(f) is the spectrum of x(t), and $f_s = \frac{1}{T_s} = 2f_1$ is the Nyquist sampling rate. [8]
2. (a) Describe the synchronization procedure for PAM, PWM and PPM signals.
   (b) Discuss about the spectra of PWM and PDM signals. [10+6]
3. (a) Why the overall transfer function of the duo-binary filter is called as Half-cycle cosine function. [8]
   (b) Give the Impulse response of the duo-binary filter and sketch the amplitude and phase response. [8]
4. Write short notes on the following:
   (a) Adaptive equalizer.
   (b) Scrambler
   (c) Characteristics of eye pattern. [5+5+6]
5. (a) Draw the block diagram of PCM Generator and explain each block.
   (b) Determine the Transmission Bandwidth in PCM. [8+8]
6. In a single-integration DM system, the voice signal is sampled at a rate of 64kHz.The maximum signal amplitude is Amax=1.
   (a) Determine the minimum value of the step size σ to avoid slope over load error.
   (b) Determine the granular noise power if the voice signals bandwidth is 3.5 kHz.
   (c) Assuming that the voice signal is sinusoidal, determine output signal power and SNR
   (d) Determine the minimum transmission bandwidth. [4+4+4+4]
7. (a) A bandpass data transmission scheme uses a PSK signaling scheme with
   S_2 (t) = A cos W_ct, $0 \leq t \leq T_b$, $W_c = 10\pi/T_b$
   S_1 (t) = - A cos W_ct $0 \leq t \leq T_b$, T_b=0.2 msec

The carrier amplitude at the receiver input is 1mv and the psd of the additive white Gaussian noise at the input is 10^{-11} Watt/Hz. Assume that an ideal correlation receiver is used. Calculate the average bit error rate of the receiver.

(b) Compare the average power requirements of binary non-coherent ASK, coherent PSK, DPSK signaling schemes operated at a data rate of 1000 bits/sec over a bandpass channel having a bandwidth of 3000Hz, $\eta/2$=10^{-10} Watt/Hz and Pe=10^{-5}. [8+8]

8. The convolutional encoder is given below Figure1:

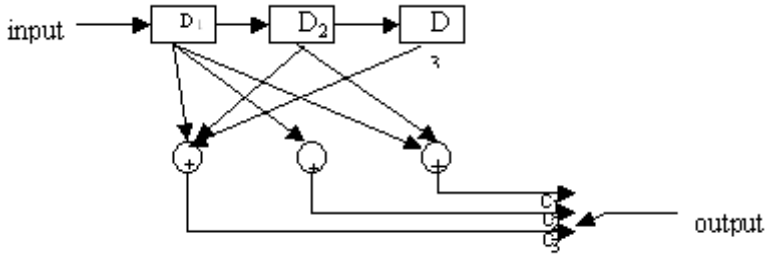

Figure 1:

(a) Find the code sequence for input message. [6]

(b) Construct a code tree for the convolutional encoder for 3-bit input data. [10]

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