

**III B.Tech I Semester Supplementary Examinations, November 2006**  
**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) A signal  $m(t) = 2 \cos(100\pi t) \cos(500\pi t)$  is ideally sampled at 700 Hz, and is sent through an ideal LPF with cut off at 650 Hz. Determine the frequency components in the filter output. What changes will be there if the sampling is done at Nyquist rate? [10]  
 (b) As applicable to pulse modulations systems, write short notes on Sampling theorem in frequency. [6]
2. (a) How is PDM wave converted into PPM system? [6]  
 (b) Explain why a single channel PPM system requires the transmission of Synchronization signal, where as a single channel PAM or PDM system Does not? [10]
3. (a) Prove that impulse response of the modified duo-binary filter consists of two sine functions that are time-shifted by  $2 T_p$  seconds, and sketch its response.  
 (b) A source emits one of three equiprobable symbols in an independent sequence at a symbol rate of 1000 bps. Design a three level PAM system to transmit the output of this source over an ideal lowpass channel with additive Gaussian noise having a PSD of  $\eta/2 = 10^{-14}$  Watt/Hz. The symbol error probability has to be maintained at or below  $10^{-6}$ . Specify the power, bandwidth requirements and  $H_T(f)$ ,  $H_R(f)$   $P_g(t)$ . [8+8]
4. (a) Explain how eye patterns are used for monitoring the performance of base band PAM system. [8]  
 (b) What is the necessity of shaping transmitted signal spectrum. [8]
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  $A_{max}=1$ .  
 (a) Determine the minimum value of the step size  $\sigma$  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) Show that the probability of bit error of a matched filter receiver is given by  $P_e = \frac{1}{2} \operatorname{erfc} \sqrt{E_b/N_0}$ . [8]
- (b) Specify a matched filter receiver for the signal  $S(t)$  shown in Figure 7b and Sketch the filter output as a function of time. [8]

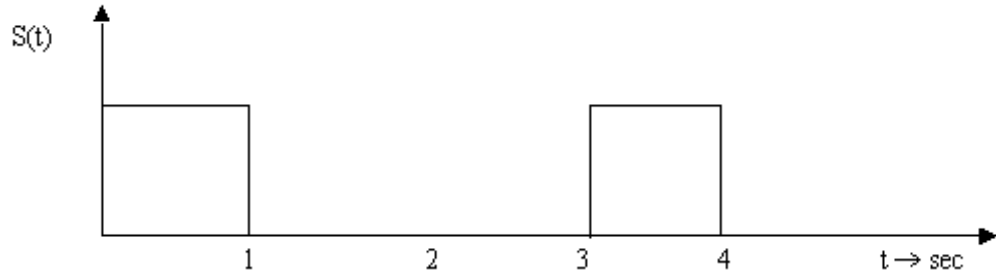


Figure 7b

8. (a) Explain the systematic code form for the binary cyclic codes?
- (b) The generator matrix for (7,4) block code is given below
- Find the parity check matrix  $H$  of this code.
  - Show that these two matrices satisfy the condition  $CH^T = 0$ .

$$G = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix}$$

[6+10]

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