

Total No. of Questions : 8]

SEAT No. :

P2428

[Total No. of Pages : 3

[5253]-151

T.E. (E & TC/Electronics)

DIGITAL COMMUNICATION

(2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Black figures to the right indicate full marks.*
- 3) *Neat diagram must be drawn whenever necessary.*
- 4) *Assume suitable data, if necessary.*

Q1) a) A signal having bandwidth of 3 KHz is to be encoded using **[8]**

- i) 8-bit PCM system
- ii) DM system

If 10 cycles of the signal are digitized, state how many bits will there in digitized output in each case. If sampling is 10 KHz. Also determine bandwidth required in each case.

- b) What is bit synchronization? Explain closed loop bit synchronizer in detail. **[6]**
- c) Explain classification of Random processes with mathematical expressions. **[6]**

OR

Q2) a) Consider a compander with $\mu = 255$ is used with $v = 3$ bit quantizer where output varies over 18.75V. For an input of 0.6V. Find quantization error with or without companding. **[8]**

- b) What are the conditions for a random process to be Wide-sense stationary? **[6]**
- c) Explain Intersymbol interference and how Eye diagram can be used to measure ISI? **[6]**

P.T.O.

- Q3) a)** In a binary transmission one message is represented by a rectangular pulse $X(t)$ and other message is transmitted by the absence of the pulse. Evaluate the signal to noise with PSD equal to $\frac{N_0}{2}$. Also sketch impulse response of matched filter. **[8]**
- b)** Sketch & explain the signal space representation of QPSK. Calculate euclidian distance for the same. **[8]**

OR

- Q4) a)** What is hypothesis Testing? Explain MAP in detail. **[8]**
- b)** Derive an expression of Error probability of integrate & dump filter. **[8]**
- Q5) a)** Sketch all the waveforms to generate MSK for the input bit stream 11000111. Write time domain expression of MSK signal. **[10]**
- b)** A binary bandpass system transmits binary data at a rate of 2.5×10^6 bits/second. During transmission AWGN with PSD equal to 10^{-14} W/Hz is added to signal. In the absence of noise received sinusoidal wave for digit 1 or 0 is 1 MV. Find the average probability of symbol error for the following system. **[8]**
- i) Coherent BPSK
- ii) Coherent BFSK
- [Erfc (2.237) = 1.84×10^{-3} , Erfc (3.1622) = 7.8×10^{-6}]

OR

- Q6) a)** Explain with block diagram BPSK Transmitter and Receiver. Explain with mathematical expressions working of BPSK Receiver. **[10]**
- b)** A binary DPSK system is to have an average probability of error $P_e < 10^{-4}$. If the average transmitted power is 150 milliwatts the channel attenuation is 80 dB and AWGN with PSD $\eta/2 = 0.5(10^{-15})$ W/Hz. Find maximum allowable bit rate for transmission. **[8]**

- Q7) a)** In a DSSS-CDMA system, the data rate $f_b = 6$ Kbps and the chip rate $f_c = 12$ mb/s. What is the jamming margin if an output SNR of 10 dB is required for a $P_e = 10^{-5}$? Assume a system loss of 1.5 dB owing to imperfections in tracking and detection. **[8]**
- b) A four stage shift register with feedback connections taken from the outputs of stages 4 and 1 through a modulo - 2 adder, is used for PN sequence generation. Assuming the initial contents of the shift register to be 0100, determine the output sequence. What is the length of the sequence? Draw the diagram of PN sequence generator. **[8]**

OR

- Q8) a)** Explain the basic principle of spread spectrum technique. With the help of block diagram and waveform explain DSSS-PSK system. **[10]**
- b) Explain the concept of orthogonality and explain OFDM Technique. **[6]**

