Total No. of Questions :8]

SEAT No. :

P3597

[Total No. of Pages :2

[5560]-551
T. E. (E&TC)
DIGITAL COMMUNICATION
(2015 Pattern) (Semester - I) (304181)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Attempt Q.No.1or Q.No.2, Q.No.3 or Q.No.4, and Q.No.5 or Q.No.6.***
2) ***Assume suitable data, if required.***

Q1) a) Draw basic digital communication block diagram and explain in detail. **[7]**

b) Explain T1 carrier system with neat diagram. **[7]**

c) Show that if a wide sense stationary process X(t) is passed through a LTI filter with impulse response h(t), then its output has constant mean square value. **[6]**

OR

Q2) a) Draw block diagram of PCM and explain in detail. **[7]**

b) A random signal $Y(t)= A X(t) \cos(2\pi fct+\varphi)$.

Where X(t) is a stationary process with zero mean. φ is the random variable distributed uniformly over $[0, 2\pi]$. Assuming X(t) and φ are independent, find mean, autocorrelation and PSD of Y(t). **[7]**

c) Represent the data 10011101 using following data formats. **[6]**

i) Unipolar RZ.

ii) Split phase Manchester.

iii) M-ary format for M=4.

Q3) a) Explain geometrical representation of signal with synthesizer and analyzer diagram. **[8]**

b) Write short notes on: **[8]**

i) Matched filter

ii) Integrate and dump receiver

OR

P.T.O.

Q4) a) A received (binary) signal has amplitude ± 2V held for a time T. The signal is corrupted by White Gaussian noise having power spectral density 10^{-4} volt^2/Hz. If the signal is processed by integrate and dump filter, what should be minimum time T of the signal so that error probability is not above 10^{-4}. **[8]**

b) Derive the expression for the probability of error of optimum filter. **[8]**

Q5) a) In a QPSK system, bit rate of NRZ stream is 10 Mbps and carrier frequency is 1 GHz. Find symbol rate of transmission and bandwidth requirement of the channel. Sketch the PSD of QPSK signal. **[8]**

b) Explain generation, Detection, spectrum, signal space diagram of BPSK system. **[8]**

OR

Q6) a) Give mathematical representation of QPSK signal. Draw the signal space diagram of QPSK signal. Write the expression of all the message points in the diagram. **[8]**

b) Compare M-ary PSK and M-ary QAM. **[8]**

Q7) a) Explain Direct sequence spread spectrum baseband transmitter and receiver with neat waveform. **[9]**

b) A BPSK-DSSS system, using coherent detection, is used to transmit data at 250bps and system has to work in a hostile jamming environment with minimum error performance of one error in 20, 000 bits. Determine the minimum chipping rate, if the jamming signal is 300 times stronger than the received signal? **[9]**

OR

Q8) a) The information bit duration in DS-BPSK SS system is 4msec. while the clipping rate is 1 MHz. Assuming an average error probability of 10^{-5}, calculate the jamming margin. Interpret the result. Given: $Q(4.25)=10^{-5}$ **[9]**

b) Write a short note on **[9]**

i) PN sequence generator

ii) Frequency Hop spread spectrum.