

Total No. of Questions :8]

SEAT No. :

P3597

[5560]-551

[Total No. of Pages :2

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.1 or 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 $Y(t) = A X(t) \cos(2\pi fct + \phi)$.
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 $\pm 2V$ held for a time T . The signal is corrupted by White Gaussian noise having power spectral density 10^{-4} volt²/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.

