

Total No. of Questions : 4]

SEAT No. :

P8571

[Total No. of Pages : 2

Oct-22/TE/Insem-549
T.E. (E & Tc)
DIGITAL COMMUNICATION
(2019 Pattern) (Semester - I) (304181)

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates:

- 1) Answer any one Question out of Q.No. 1 or 2 and Q.No. 3 or 4.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) With help of mathematical expression explain stationary random process, non-stationary random process & wide sense stationary processes and Ergodic processes. **[8]**

b) The random process $X(t) = X$, where X is a random variable uniformly distributed in $(-1,1)$. Find mean and autocorrelation function for the process and check whether the process is wide sense stationary or not. **[5]**

c) Define White noise. **[2]**

OR

Q2) a) Explain the following terms with mathematical expressions:

- i) Mean
- ii) Autocorrelation function
- iii) Cross-correlation function
- iv) Auto covariance function

[8]

b) A wide sense stationary random processes $X(t)$ is applied to input of an LTI system with impulse response $h(t) = 3e^{-2t}u(t)$. Find the mean value of output $Y(t)$ of system if $E[X(t)] = 2$. **[7]**

P.T.O.

Q3) a) Explain with a neat block diagram and waveforms generation of Offset QPSK. Also draw signal space diagram for QPSK. **[8]**

b) Compare BPSK, BFSK & QPSK with respect to following parameters.

i) Mathematical expression

ii) Bits per symbol

iii) Bandwidth

iv) Probability of error

v) Euclidean distance

vi) Symbol duration

vii) Applications

[7]

OR

Q4) a) With a neat block diagram and mathematical expression explain the generation and coherent detection of BFSK. **[8]**

b) A binary data is transmitted at a rate of 10^6 Mbps over a channel whose bandwidth is 6 MHz. Find signal energy per bit at a receiver input for coherent BPSK to achieve probability error. $P_e \leq 10^{-4}$ assume $N_0/2 = 10^{-10}$ W/Hz. $\text{Erf}(2.6) = 0.9998$. **[7]**

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