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. Final signal energy per bit at a receiver input for coherent BPSK to achieve probability error. Pe $\leq 10^{-4}$ assume No/2 $= 10^{-10}$ W/Hz. Erf $(2.6) = 0.9998$. **[7]**

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