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B. Tech 3rd Semester Examination

Communication Theory (N.S.)

EC-214

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all, select one question from each sections A, B, C and D. Section E question 9 is compulsory.

SECTION - A

1. Classify different types of systems & discuss the properties in mathematical terms which should be satisfied for these classifications. **(20)**

2. State Shannon-Hartley theorem. Explain the bondwidth & SNR trade of based upon the theorem. What do you mean by Shannon limit? **(20)**

SECTION - B

3. State sampling theorem for Band limited signals. Explain what is nyquist interval & the Aliasing effect & how it can be removed. Consider a signal $x(t)=\sin^2(2\pi\times10^3xt)$. Find the Nyquist rate with which it can be sampled. **(20)**

4. Calculate the Fourier transform of

   (1) $x(t) = A \quad t, \leq t \leq t_2$
   $0 \quad$ otherwise

   (2) $x(t) = \delta(t-t_0)\ t_0 > 0$ **(20)**

SECTION - C

5. Find the expression to calculate energy density spectrum. Calculate energy density spectrum of the gate function with amplitude A & width τ. Explain Parsevals power theorem. **(20)**

6. Explain the time response & frequency response analysis of the LTI systems. **(20)**

SECTION - D

7. Explain the different sources of Noise. Explain in detail thermal Noise & shot noise in terms of their generation & spectral density. **(20)**

8. The joint density function of two random variables is given by

$$f(x,y)=\begin{Bmatrix} xy/8 & 0<x<2,\ 1<y<3 \\ 0 & \text{otherise} \end{Bmatrix}$$

Find (a) E(x) (b) E(y) (c) E(2x+3y)

Explain Gaussian probability density function. **(20)**

SECTION - E

9. Write short notes on:

(a) General communication system block diagram.

(b) Dirac Delta function & its properties.

(c) Auto correlation function.

(d) Band limited white noise process. **(5×4=20)**