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May 2007

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J-1093 [6228 A] [2957]

B.Tech. (Semester - 4th)

SIGNAL AND SYSTEMS (EC - 206)

Time : 03 Hours Maximum Marks : 60

Instruction to Candidates:

1) Section - A is **compulsory.**
2) Attempt any **Four** questions from Section - B.
3) Attempt any **Two** questions from Section - C.

Section - A

Q1) *(10 x 2 = 20)*

a) Differentiate between even and odd signals.

b) State the Parseval's theorem.

c) If the Fourier transform of $x(t)$ is $X(j\omega)$. What will be the Fourier transform of $\frac{dx(t)}{dt}$?

d) Differentiate between statistical average and time average.

e) Under what conditions a process is called an ergodic process?

f) State the sampling theorem.

g) Name any four sources of noise.

h) Define noise figure.

i) What do you mean by burst noise?

j) What do you mean by causal signal?

Section - B

(4 x 5 = 20)

Q2) Discuss the properties of LTI system.

Q3) Discuss the working principle and applications of Matched filter.

P.T.O.

Q4) For the continuous time periodic signal $x(t) = 2 + \cos(2\pi t / 3) + 4\sin(5\pi t/3)$, determine the fundamental frequency and the Fourier series coefficients a_k.

Q5) Find the Fourier transform of $x(t) = e^{-at}\, u(t)$; $a > 0$. Also sketch the amplitude and phase plot of $X(j\omega)$.

Q6) Discuss the experimental determination of Noise figure.

Section - C

(2 x 10 = 20)

Q7) State and prove the convolution theorem. With the help of an example explain the graphical method of obtaining the convolution between the two signals.

Q8) (a) A random variable has an exponential probability density function given by $f(x) = ae^{-b|x|}$, where a and b are constants. Find the relationship between a and b.

(b) Write short note on random processes.

Q9) (a) Determine which of the following properties, memoryless, linearity, time-invariance, causality, and stability the given systems hold.

(i) $y(n) = nx(n)$,

(ii) $y(t) = \int_{-\infty}^{3t} x(\tau)\, d\tau$.

(b) Write short note on thermal noise.