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Total No. of Questions : 09] [Total No. of Pages : 02

B.Tech. (Sem. - 4th)

SIGNALS AND SYSTEMS

SUBJECT CODE : EC - 206

Paper ID : [A0308]

[Note : Please fill subject code and paper ID on OMR]

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) What do you mean by a memoryless system?

b) Define signal to noise ratio?

c) Consider the sinusoidal signal

$$x(t) = A\cos(\omega t + \phi)$$

Determine the average power of $x(t)$.

d) Differentiate between periodic and aperiodic sequences?

e) What do you mean by noise figure?

f) Define convolution theorem?

g) Find conjugate symmetric party of the sequence

$$x(n) = je^{\frac{jn\Pi}{4}}$$

h) Define sampling theorem.

i) Define probability of random events?

j) Define power spectral density?

Section - B

(4 x 5 = 20)

Q2) Discuss the response of LTI systems to complex exponentials.

Q3) Explain the following:

(a) Gaussian noise.

(b) FET noise.

Q4) Show that the system described by following equation is linear:

$$\frac{dy}{dt}+t^2 y(t)=(2t+3)x(t)$$

Q5) State and prove time scaling and multiplication properties of fourier series.

Q6) For a signal $x(t) = e^{-at}u(t)$. Find the Laplace transform $X(s)$ and its ROC.

Section - C

(2 x 10 = 20)

Q7) (a) Suppose that we are given the following information about an LTI system:

(1) The system is causal.

(2) The system function is rational and has only two poles, at s = -2 and s=-4.

(3) If $x(t) = 1$, then $y(t) = 0$.

(4) The value of the impulse response at $t = 0^+$ is 4.

(b) Discuss in detail about envelope detector.

Q8) (a) Discuss the properties of Laplace transform.

(b) For a certain LTIC system the impulse response h(t) = u(t).

(i) Determine the characteristic root(s) of this system.

(ii) Is this system asymptotically or marginally stable, or is it unstable.

(iii) Is this system BIBO stable?

(iv) What can this system be used for?

Q9) (a) Calculate SNR for matched filter.

(b) Discuss relationship between BIBO and Asymptotic stability.