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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 × 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

$$x(n) = j e^{\frac{jn\pi}{4}}$$

- h) Define sampling theorem.
- i) Define probability of random events?
- j) Define power spectral density?

Section - B

(4 × 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 × 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.

