

B TECH
(SEM-III) THEORY EXAMINATION 2018-19
SIGNALS AND SYSTEMS

Time: 3 Hours

Total Marks: 100

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief. 2 x 10 = 20

- a) What is the difference between energy and power signal?
- b) Sketch the following signal $x(t) = e^{-|t|}$, $-4 \leq t \leq 4$?
- c) If $X(s) = e^{-2s}$ is the one sided Laplace transform of $x(t)$, what is $x(t)$?
- d) Find the unilateral Z-transform of $n^2 u(n)$?
- e) What is Fourier transform of $x(t) = \cos(\omega_c t + \Theta)$?
- f) What is the relationship between LT and FT?
- g) Show that the system $y(n) = x(n) + y(n-1)$ is unstable?
- h) What is the condition on the impulse response function of an LSI system if the system is to be memoryless?
- i) Define poles and zeros?
- j) Explain why an ideal LPF is not physically realizable?

SECTION B

2. Attempt any three of the following: 10 x 3 = 30

a) Check whether the signals are periodic? If yes, find the fundamental period.

1. $x(t) = a \sin 4t + b \cos 7t$

2. $x(n) = 2 \cos^2 \pi n / 6$

b) Find the two-sided inverse Laplace transform of

$$X(s) = \frac{-3}{(s-1)(s+2)}, \text{ ROC } -2 < \sigma < 1?$$

c) Compare between CTFT & DTFT?

d) A discrete time system is described by the follow relation $y(n) = nx(n)$? Is this system (1) linear (2) time-invariant.

e) Obtain Cascade & Parallel realization of the transfer

function $H(s) = \frac{5s^3}{s^3 + 6s^2 + 11s + 6}$?

SECTION C

3. Attempt any one part of the following: 10 x 1 = 10

a) Sketch the following signal and determine their even and odd component

(1). $x(t) = \begin{cases} 0.8t, & 0 \leq t \leq 4 \\ 0, & \text{otherwise} \end{cases}$

(2). $x(n) = \begin{cases} n, & 1 \leq n \leq 3 \\ 0, & \text{otherwise} \end{cases}$

b) Determine the linear convolution of the sequence if $x(n) = \{1, -1, 2\}$ and $y(n) = \{1, 0, 1\}$.

4. Attempt any one part of the following:

10 x 1 = 10

- a) Discuss Bilateral Z-transform & the properties of ROC?
- b) Solve the First order difference equation $x(n)-3x(n-1) = 6$ with $x(-1) = 4$ using unilateral Z-transform.

5. Attempt any one part of the following:

10 x 1 = 10

- a) State and prove the Parseval's Theorem?
- b) Determine the DTFT of $x(n)=(a^n \cos \omega n)U(n)$, $|a|<1$?

6. Attempt any one part of the following:

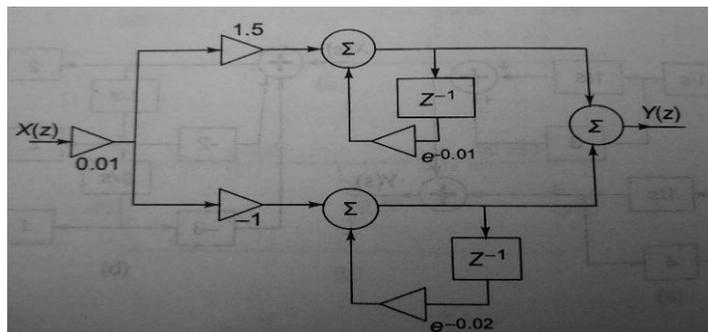
10 x 1 = 10

- a) Find the auto-correlation function and the energy spectral density of the signal $x(t) = A\Pi(t / 2T)$?
- b) Show that the system given by the difference equation $y(n) = 1/4x(n) + 1/4y(n-1) - 1/2y(n-2)$ is causal and BIBO stable?

7. Attempt any one part of the following:

10 x 1 = 10

- a) Determine the system function $H(z)$ and write down the difference equation of the system?



- b) Determine the system function $H(z)$ of the system shown & obtain its parallel realization?

