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CSE 181305

Roll No. of candidate

2012/23

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2023

BINA CHOWDHURY CENTRAL LIBRARY
(GIT & CIPS)
Azara, Hatkhowapata,
Guwahati - 781017

B.Tech. 3rd Semester End-Semester Examination

BASICS OF SIGNAL AND SYSTEMS

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *four* question from questions to 2 to 7.

1. Answer any ten questions : (10 × 1 = 10)

- (i) A random signal has
- (a) no uncertainty (b) uncertainty
(c) both (a) and (b) (d) none of above
- (ii) $x(t) = r(t)r(t-2)$ is a
- (a) power signal (b) energy signal
(c) neither (a) or (b) (d) both (a) and (b)
- (iii) A signal $a^n u(n)$ is an energy signal if
- (a) $|\alpha| < 1$ (b) $|\alpha| > 1$
(c) $|\alpha| = 1$ (d) $|\alpha| = 0$
- (iv) The net area of sinusoids over complete periods is
- (a) finite (b) infinite
(c) zero (d) none of these
- (v) $y(n) = x(n) + nx(n-1)$ is for a
- (a) dynamic system (b) causal system
(c) linear system (d) all of above

[Turn over

(vi) The Fourier Transform of $e^{-a|t|}$

(a) $\frac{1}{a^2 + w^2}$

(b) $\frac{2a}{a^2 - w^2}$

(c) $\frac{2w}{a^2 + w^2}$

(d) $\frac{2a}{a^2 + w^2}$

(vii) The impulse response of a system is $h(t)$ when the input is $\delta(t)$. The output $y(t)$ will be

(a) $y(t)$

(b) $\delta(t)$

(c) $h(t)$

(d) none of these

(viii) Which one of the following cannot be ROC of $\frac{5}{(s+1)(s+2)}$?

(a) $\text{Re}(s) > -1$

(b) $\text{Re}(s) < -2$

(c) $-2 < \text{Re}(s) < -1$

(d) $-1 < \text{Re}(s) < -2$

(ix) In communication, sampling technique leads to

(a) more efficiency

(b) low cost

(c) high speed

(d) all of above

(x) A signal is band limited to 50 kHz. The signal can be uniquely determined by its value at uniform intervals of duration less than

(a) $50 \mu s$

(b) 50 ms

(c) $100 \mu s$

(d) $10 \mu s$

(xi) The sampling rate is always between

(a) 0 and 2 B

(b) 2 B and 4 B

(c) B and 2 B

(d) $> 4 B$

(xii) Aliasing occurs when the signal is

(a) over sampled

(b) under sampled

(c) critically sampled

(d) not sampled

2. (a) Determine the power and rms value of the signal $x(t) = A \sin(\omega t + \theta)$. (10)

(b) Find if the following signal is energy signal or power signal and calculate the energy or power : $A e^{-at} u(t)$, $a > 0$. (5)

3. (a) Explain the conditions under which any periodic waveform can be expressed using Fourier Series? Show that the sum of two sinusoids is periodic provided that their frequencies are integral multiples of a fundamental frequency ω_0 . (3 + 7 = 10)
- (b) Find the Fourier transform of : (5)
 $x(t) = \sin(8t + 0.1\pi)$
4. (a) Find the inverse Laplace transform of : (5 + 5 = 10)
- (i) $X(S) = \frac{s}{s^2 a^2 + b^2}$
- (ii) $X(S) = \frac{3s^2 + 22s + 27}{(s^2 + 3s + 2)(s^2 + 2s + 5)}$
- (b) What is aliasing? How can Aliasing be avoided? With suitable diagram, explain Anti-aliasing filter. (1 + 1 + 3 = 5)
5. (a) Check whether the following system are BIBO stable or not : (5 + 5 = 10)
- (i) $y(n) = ax(n) + b$
- (ii) $h(n) = \delta(n) + \cos n\pi$
- (b) Discuss the advantages and limitations of Z transform. (5)
6. (a) Discuss the relation between Discrete Time Fourier Transform and Z transform with appropriate equations. (10)
- (b) Discuss the properties of the ROC in Laplace Transform. (5)
7. Write short notes on (any three) : (3 × 5 = 15)
- (a) Circular convolution
- (b) Gibb's phenomenon
- (c) Nyquist Rate
- (d) Reconstruction filter.

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