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BRAINWARE UNIVERSITY

Term End Examination 2023-2024
Programme – B.Tech.(ECE)-2020
Course Name – Digital Signal Processing
Course Code - PCC-EC504
(Semester V)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) If all the poles of H(z) are outside the unit circle, then the system is indicated as
   a) causal
   b) Only BIBO stable
   c) BIBO stable and causal
   d) None of these

(ii) A linear time invariant system is represented as BIBO stable if and only if the ROC of the system function
   a) Includes unit circle
   b) Excludes unit circle
   c) Is an unit circle
   d) None of these

(iii) The linear phase realization structure is used to explain,
   a) FIR systems
   b) IIR systems
   c) FIR and IIR systems
   d) all discrete time systems

(iv) The interface between an analog signal and a digital processor is explained as
   a) A/D converter
   b) Modulator
   c) D/A converter
   d) Demodulator

(v) The symmetric impulse response having even number of samples cannot be used to develop
   a) lowpass filter
   b) bandstop filter
   c) highpass filter
   d) bandpass filter

(vi) Symmetric impulse response having even number of samples can be used to develop
   a) lowpass and highpass filters
   b) lowpass and bandpass filters
   c) lowpass and bandstop filters
   d) only lowpass filters

(vii) To develop the butterworth and chebyshev transfer function , when N is odd, the nature of poles are,
   a) complex and exist as conjugate pair
   b) complex but not conjugate pairs
   c) one pole is complex and other poles are real
   d) one pole is real and other poles are complex

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(viii) If z-transform of x(n) is X(z) then determine the value x(-n) is

a) -X(z) b) X(-z)
c) -X(1/z) d) X(1/z)

(ix) Choose the correct alternative that IIR stand for in the context of filter design

a) Infinite Impulse Response b) Irregular Impulse Rejection
c) Integrated Input Resonance d) Iterative Input Reconstruction

(x) In signal processing, estimate the term for the process of converting a digital signal back into an analog signal

a) Sampling b) Reconstruction
c) Quantization d) Modulation

(xi) Choose the main advantage of the Fast Fourier Transform (FFT) algorithm over the direct computation of the Discrete Fourier Transform (DFT)

a) FFT can handle continuous signals. b) FFT requires less memory.
c) FFT is more accurate d) FFT is much faster for large input sizes.

(xii) Differentiate a following statement that is true regarding the relationship between the Z-Transform and the Fourier Transform

a) The Z-Transform is a special case of the Fourier Transform. b) The Fourier Transform is a special case of the Z-Transform
c) The Z-Transform and Fourier Transform are unrelated d) The Z-Transform is the continuous-time version of the Fourier Transform

(xiii) The set of all values of z for which X(z) attains a finite value is defined as

a) Radius of convergence b) Region of convergence
c) Radius of divergence d) Feasible solution

(xiv) If all the poles of the system function H(z) have magnitude smaller than 1, then the system will be represented as

a) stable b) unstable
c) BIBO stable d) None of these

(xv) Identify for what kind of signals one sided z-transform is unique?

a) All signals b) Anti-causal signal
c) Causal signal d) None of these

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Describe and proof differentiation property of z-transform (3)

3. Describe and proof time reversal property of DFT (3)

4. Explain the relation between DFT, Z-transform and Fourier transform (3)

5. Explain stable and unstable system with condition of stability (3)

6. Illustrate and proof time shifting property of z-transform (3)

OR

Illustrate and proof differentiation property of z-transform (3)

Group-C
(Long Answer Type Questions) 5 x 6=30

7. Compare the Hamming and Blackman window. (5)
8. Determine the relation between Fourier Transform and Z-Transform. (5)

9. Explain the relationship between s-plane and Z-plane. (5)

10. Determine whether the following system is time-invariant or time variant: (5)
    $y(n) = x(-n)$

11. Explain the FIR filter design by window method for symmetry condition (5)

12. Design a linear phase FIR filter using rectangular window by taking 7 samples of window sequence and with a cut off frequency $\omega_c = 0.2\pi$ rad/sec. (5)

OR

Write the procedure for design of FIR filter by Fourier series method. (5)

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