BRAINWARE UNIVERSITY

Term End Examination 2022
Programme – B.Tech.(ECE)-2019/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 the system function H(z) have magnitude smaller than 1, then the system will be categorized as,

    a) stable   b) unstable

    c) BIBO stable   d) stable and BIBO Stable

(ii) 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

(iii) An analog signal $x_a(t) = 10\cos 200\pi t$. If sampling frequency is 150Hz, find an alias frequency corresponding to $F_s = 150Hz$

    a) 200 Hz   b) 100 Hz

    c) 10 Hz   d) 50 Hz

(iv) Select the correct statement for a chebyshev analog filter

    a) In type-1, the magnitude reponse is monotonic in passband and equiripple in stopband.

    b) In type-1, the magnitude reponse is monotonic in passband and stopband.

    c) In type-2, the magnitude reponse is equiripple in stopband and passband.

    d) In type-2, the magnitude reponse is monotonic in passband and equiripple in stopband.

(v) Select the characteristic/s of an ideal filter from the followings:

    a) Phase Response   b) Zero gain in stop band

    c) Constant gain in passband   d) All of these

(vi) In a signal x(n), if 'n' is replaced by $\frac{n}{3}$, then it is defined as
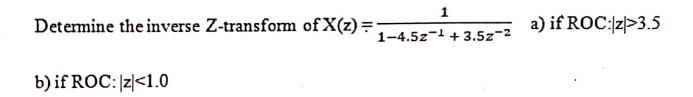
    a) up sampling   b) folded version

    c) down sampling   d) shifted version

(vii) The interface between an analog signal and a digital processor is recognized as

a) A/D converter

b) Modulator

c) D/A converter

d) Demodulator

(viii) The symmetric impulse response having even number of samples cannot be used to design

a) lowpass filter

b) bandstop filter

c) highpass filter

d) bandpass filter

(ix) The system $y1(n) = x(-n-3)$ and $y2(n) = \cos[x(n)]$ are expressed as

a) y1 is BIBO stable , y2 stable

b) y1 is unstable , y2 stable

c) y1 is unstable , y2 unstable

d) cannot be defined

(x) The system $y1(n) = x(n) + 2x(n+3)$ and $y2(n) = nx(n)$ are described as

a) y1 is non causal , y2 causal

b) y1 is non causal , y2 non causal

c) y1 is causal , y2 causal

d) y1 is causal , y2 non causal

(xi) The system $y(n) = \sin[x(n)]$ is indicated as

a) stable

b) BIBO stable

c) unstable

d) none of these

(xii) The process of conversion of continuous tine signal into discrete time signal is recognized as

a) aliasing

b) sampling

c) convolution

d) none of these

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

a) $-X(z)$

b) $X(-z)$

c) $-X(z^{-1})$

d) $X(z^{-1})$

(xiv) If the z-transform of x(n) is X(z), then determine z-transform of $(0.5)n\ x(n)$ is,

a) $X(0.5z)$

b) $X(0.5^{-1}z)$

c) $X(2^{-1}z)$

d) $X(2z)$

(xv) Determine The ROC of the signal $x(n) = a^{\,n}$ for $-5 < n < 5$ is,

a) entire z-plane

b) entire z-plane except z=0 and z= ∞

c) entire z-plane except z=0

d) entire z-plane except z=∞

Group-B
(Short Answer Type Questions)

3 x 5=15

2. Differentiate between linear convolution and circular convolution. (3)

3. Determine the inverse Z-transform of the function, $X(z) = \dfrac{3 + 2z^{-1} + z^{-2}}{1 - 3z^{-1} + 2z^{-2}}$ (3)

4. Write the procedure for design of low pass digital butterworth filter (3)

5. Using Z-transformation determine the convolution of two sequence: x1(n)={1,2,-1,0,3} ; x2(n)= {1,2,-1} (3)

6. Calculate IDFT of $Y(K) = \{1, 0, 1, 0\}$ (3)

OR

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

Group-C
(Long Answer Type Questions)

5 x 6=30

7. The output y(n) and the input x(n) of a discrete time system are related by the equation y(n) = nx(n). Identify whether the system is LTI or not. (5)

8. (5)

Determine the inverse Z-transform of $X(z) = \dfrac{1}{1-4.5z^{-1}+3.5z^{-2}}$ a) if ROC:$|z|>3.5$

b) if ROC: $|z|<1.0$

9. In an LTI system the input $x(n) = \{1,2,3\}$ and the impulse (5) response $h(n) = \{-1,-1\}$. Evaluate the response of the LTI System by Radix2 DIT FFT.

10. Express the output of a linear time invariant discrete-time system as a convolution sum of the (5) input signal x[n] and the system impulse response function h[n] and explain its properties.

OR

(5)

$$y(n) = \cos[x(n)]$$

Illustrate whether or not the following system is LTI:

11. Calculate 8-point DFT of the sequence x(n)={1,2,3,4,4,3,2,1} using decimation in time radix-2 (5) FFT algorithm

OR

(5)

For the sequence $x(n) = \{1,1,0,0,-1,-1,0,0\}$, determine the 8-point DFT.

12. (5)

For the analog filter having transfer function $h(s) = \dfrac{1}{s(s+1)}$. Determine $H(z)$

using impulse invariance method.

OR

Compare the Hamming and Blackman window. (5)

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