University of Mumbai
Examination 2020

Examinations Commencing from 7th January 2021 to 20th January 2021

Program: **Electronics and Telecommunication Engineering**

Curriculum Scheme: Rev2016

Examination: TE Semester V

Course Code: ECC504 and Course Name: Discrete Time Signal Processing

Time: 2 hour Max. Marks: 80

Q1.	**Choose the correct option for following questions. All the questions are compulsory and carry equal marks**
1.	x(n)*δ(n-k) =?
Option A:	x(n)
Option B:	x(k)
Option C:	x(k)*δ(n-k)
Option D:	x(k)*δ(k)
2.	What is the cross correlation sequence of the following sequences? x(n)= {....0,0,2, -1,3,7,1,2, -3,0,0....} y(n)= {....0,0,1, -1,2, -2,4,1, -2,5,0,0....}
Option A:	{10,9,19,36, -14,33,0,7,13, -18,16,7,5, -3}
Option B:	{10, -9,19,36, -14,33,0,7,13, -18,16, -7,5, -3}
Option C:	{10,9,19,36,14,33,0, -7,13, -18,16, -7,5, -3}
Option D:	{10, -9,19,36, -14,33,0, -7,13,18,16,7,5, -3}
3.	The impulse response of a LTI system is h(n)= {1,1,1}. What is the response of the signal to the input x(n)= {1,2,3}?
Option A:	{1,3,6,3,1}
Option B:	{1,2,3,2,1}
Option C:	{1,3,6,5,3}
Option D:	{1,1,1,0,0}
4.	The output signal when a signal x(n)=(0,1,2,3) is processed through an 'Identical' system is?
Option A:	(3,2,1,0)
Option B:	(1,2,3,0)
Option C:	(0,1,2,3)

Option D:	None of the mentioned
5.	If a system does not have a bounded output for bounded input, then the system is said to be _____
Option A:	Causal
Option B:	Non-causal
Option C:	Stable
Option D:	Non-stable
6.	The output signal when a signal x(n)=(0,1,2,3) is processed through an 'Delay' system is?
Option A:	(3,2,1,0)
Option B:	(1,2,3,0)
Option C:	(0,1,2,3)
Option D:	None of the mentioned
7.	The process of converting discrete-time continuous valued signal into discrete-time discrete valued (digital) signal is known as _____
Option A:	Sampling
Option B:	Quantization
Option C:	Coding
Option D:	Modulating
8.	What is output signal when a signal x(t)=cos(2*pi*40*t) is sampled with a sampling frequency of 20Hz?
Option A:	cos(pi*n)
Option B:	cos(2*pi*n)
Option C:	cos(4*pi*n)
Option D:	cos(8*pi*n)
9.	What is the Nyquist rate of the signal x(t)=3cos(50*pi*t)+10sin(300*pi*t)-cos(100*pi*t)?
Option A:	50Hz
Option B:	100Hz
Option C:	200Hz
Option D:	300Hz
10.	If the sampling rate Fs satisfies the sampling theorem, then the relation

	between quantization errors of analog signal(eq(t)) and discrete-time signal(eq(n)) is?
Option A:	eq(t)=eq(n)
Option B:	eq(t)<eq(n)
Option C:	eq(t)>eq(n)
Option D:	not related
11.	If x(n)=(0,0,1,2,3,4,0,0) then x(n-2) is?
Option A:	(0,0,2,4,6,8,0,0)
Option B:	(0,0,1,2,3,4,0,0)
Option C:	(1,2,3,4,0,0,0,0)
Option D:	(0,0,0,0,1,2,3,4)
12.	What is the ROC of the signal x(n)=δ(n-k), k>0?
Option A:	z=0
Option B:	z=∞
Option C:	Entire z-plane, except at z=0
Option D:	Entire z-plane, except at z=∞
13.	What is the ROC of z-transform of finite duration anti-causal sequence?
Option A:	z=0
Option B:	z=∞
Option C:	Entire z-plane, except at z=0
Option D:	Entire z-plane, except at z=∞
14.	Which of the following justifies the linearity property of z-transform? [x(n)↔X(z)].
Option A:	x(n)+y(n) ↔ X(z)Y(z)
Option B:	x(n)+y(n) ↔ X(z)+Y(z)
Option C:	x(n)y(n) ↔ X(z)+Y(z)
Option D:	x(n)y(n) ↔ X(z)Y(z)
15.	If X(z) is the z-transform of the signal x(n), then what is the z-transform of the signal x(-n)?
Option A:	X(-z)
Option B:	X(z-1)

Option C:	X-1(z)
Option D:	None of the mentioned
16.	Which of the following is true regarding the number of computations required to compute an N-point DFT?
Option A:	N^2 complex multiplications and N(N-1) complex additions
Option B:	N^2 complex additions and N(N-1) complex multiplications
Option C:	N^2 complex multiplications and N(N+1) complex additions
Option D:	N^2 complex additions and N(N+1) complex multiplication
17.	If N=LM, then what is the value of W_N^{mqL}?
Option A:	W_M^{mq}
Option B:	W_L^{mq}
Option C:	W_N^{mq}
Option D:	None of the mentioned
18.	What is the model that has been adopt for characterizing round of errors in multiplication?
Option A:	Multiplicative white noise model
Option B:	Subtractive white noise model
Option C:	Additive white noise model
Option D:	None of the mentioned
19.	What is the total number of quantization errors in the computation of single point DFT of a sequence of length N?
Option A:	2N
Option B:	4N
Option C:	8N
Option D:	12N
20.	How many number of bits are required to compute the DFT of a 1024-point sequence with a SNR of 30db?
Option A:	5
Option B:	10
Option C:	5
Option D:	20

Option 3

Q2.	20 marks
A.	**Solve any Two** **5 marks each**
i.	Explain the application of DSP in Adaptive Thresholding and automatic detection.
ii.	Explain the concept of special instructions in DSP processors
iii.	Find the linear convolution of $x_1(n)$ and $x_2(n)$ if $x_1n(n) = \{1,2,3,4\}$ and $x_2n = \{1,1,1\}$
B.	**Solve any One 10 mark each**
i.	Let x(n) be 8 point sequence, its corresponding DFT X(K) is X(k) = {(0.5, (2 + j), (3 + j2), (j), (3), (-j), (3 – j2), (2 - j)} Find x(n) by performing IFFT.
ii.	Design a second Order DT butterworth filter with cut-off frequency of 1 KHz and sampling frequency of 10^4 samples/sec by bilinear transformation.

Q3.	20 marks
A.	**Solve any Two** **5 marks each**
i.	Obtain a digital filter transfer function by applying IIT on the analof TF. $H_a(s) = \frac{s}{s^2 + 3s + 2}$ Use F_s = 1 K samples/ sec
ii.	Explain the application of Digital Signal Processors in Dual tone Multifrequency detection using Goertzel Algorithm
iii.	Compare bilinear transform and Impulse invariance method.
B.	**Solve any One 10 mark each**
i.	Explain Overlap save and add method for long data filtering
ii.	Obtain DFT of a sequence x (n) = (0.5, 0.5, 0.5, 0.5, 0, 0, 0, 0) Using Decimation in frequency FFT algorithm.