

University of Mumbai
Examination 2021 under cluster __ (Lead College: RAIT)
Examinations Commencing from 1st June 2021
Program: Instrumentation Engineering
Curriculum Scheme: Rev2016
Examination: TEsSemester VI
Course Code: ISC604 and Course Name: DSP

Time: 2 hour Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	The ROC of a system is the
Option A:	range in which the signal is free of noise
Option B:	range of z for which the z transform converges
Option C:	range of frequency for which the z transform exists
Option D:	range of frequency for which the signal gets transmitted
2.	$W_N^{(K + \frac{N}{2})} = ?$
Option A:	W_N^K
Option B:	$-W_N^K$
Option C:	W_N^{-K}
Option D:	+j
3.	The similarity between the Fourier transform and the z transform is that
Option A:	Both convert discrete time domain to frequency spectrum domain
Option B:	Both convert frequency spectrum domain to discrete time domain
Option C:	Both convert analog signal to digital signal
Option D:	Both convert digital signal to analog signal
4.	The direct computation of an N point DFT requires complex multiplication and complex additions.
Option A:	N(N-1), N x N
Option B:	N x N, N(N-1)
Option C:	2N + 1, 2N
Option D:	2 N, 2N + 1
5.	DIT algorithm divides the sequence into
Option A:	Positive and negative values
Option B:	Upper higher and lower spectrum
Option C:	Small and large samples
Option D:	Even and odd samples
6.	Radix - 2 FFT algorithm performs the computation of DFT in
Option A:	$N \log_2 N$ multiplications & $(N/2) \log_2 N$ additions
Option B:	$(N/2) \log_2 N$ stages
Option C:	$(N/2) \log_2 N$ multiplications & $N \log_2 N$ additions
Option D:	$N/2$ stages

7.	Which of the following is not used in the realization of a system
Option A:	Delay elements
Option B:	Multipliers
Option C:	Adders
Option D:	Subtractors
8.	For a system function $H(s)$ to be stable
Option A:	The zeros lie in left half of the s plane
Option B:	The zeros lie in right half of the s plane
Option C:	The poles lie in left half of the s plane
Option D:	The poles lie in right half of the s plane
9.	The transformation technique in which there is one to one mapping from s -domain to z -domain is
Option A:	Approximation of derivatives
Option B:	Impulse invariance method
Option C:	Bilinear transformation method
Option D:	Backward difference for the derivative
10.	For long data filtering following methods are used _____
Option A:	Overlap multiply and save method
Option B:	Overlap add and save method
Option C:	Overlap subtract and add method
Option D:	Frequency sampling
11.	One of the zero of causal linear phase FIR filter lies at $Z = 1/2$. Therefore other zero is at.....
Option A:	2
Option B:	1
Option C:	-1
Option D:	0
12.	For anti-symmetric filter having even length a zero exists at
Option A:	$Z=2$
Option B:	$Z=-1$
Option C:	$Z=1$
Option D:	$Z=0$
13.	FIR filters are
Option A:	Recursive type
Option B:	Non recursive type
Option C:	Neither recursive nor non recursive
Option D:	Unstable
14.	Gibbs phenomena can be reduced by using _____ technique when designing FIR filter
Option A:	impulse invariance
Option B:	bilinear
Option C:	frequency sampling

Option D:	windowing
15.	For Hanningwindow the main lobe width is equal to
Option A:	$2\pi/N$
Option B:	$4\pi/N$
Option C:	$8\pi/N$
Option D:	$12\pi/N$
16.	In Bilinear Transformation Method poles are transferred by using
Option A:	$s = \frac{2}{T_s} \left(\frac{Z - 1}{Z + 1} \right)$
Option B:	$s = \frac{T_s}{2} \left(\frac{Z - 1}{Z + 1} \right)$
Option C:	$s = \frac{2}{T_s} \left(\frac{Z + 1}{Z - 1} \right)$
Option D:	$s = \frac{T_s}{2} \left(\frac{Z + 1}{Z - 1} \right)$
17.	Which of the following windows has a time domain sequence $h(n) = \frac{1}{2} \left(1 - \cos \frac{2\pi n}{M-1} \right)$
Option A:	Bartlett window
Option B:	Blackman window
Option C:	Hamming window
Option D:	Hanning window
18.	Recursive least squares (RLS) is an adaptive filter algorithm that recursively finds the coefficients that minimize a
Option A:	weighted linear least squares cost function
Option B:	mean square error
Option C:	unweighted linear least squares cost function
Option D:	square error
19.	The TMS320C54x has _____16-bit auxiliary registers
Option A:	7
Option B:	5
Option C:	8
Option D:	11
20.	The IDLE2 instruction is used to
Option A:	shut down the CPU
Option B:	shut down the CPU and on-chip peripherals
Option C:	shut down the '54x processor completely
Option D:	power on '54x processor

Q2.	
A	Solve any Two 5 marks each
i.	Find DFT of $x(n) = \{1, 2, 1, 0\}$
ii.	Convert the analog filter with transfer function $H_a(s) = \frac{s+0.1}{(s+0.1)^2+9}$ into a digital filter using impulse invariant transformation.
iii.	Compare IIR and FIR Filter
B	Solve any One 10 marks each
i.	Draw the architecture of TMS320C54X and explain internal memory organization
ii.	Design a Butterworth digital filter using the bilinear transformation. The specification of the desired low-pass filter are $0.9 \leq H(\omega) \leq 1; 0 \leq \omega \leq \pi/2$ $ H(\omega) \leq 0.2; 3\pi/4 \leq \omega \leq \pi$

Q3.	Solve any Two Questions out of Three 10 marks each
A	An LTI system is described by the equation $y(n)+2y(n-1)-y(n-2) = x(n)$ Determine the Cascade and parallel realization structure of the system
B	Design a digital FIR low pass filter using rectangular window by taking 9 samples of $w(n)$ and with a cutoff frequency of 1.2 rad/sec.
C	Compute the DFT of the sequence $x(n) = \{2, 2, 2, 2, 1, 1, 1, 1\}$ by Radix 2 DIF-FFT algorithm