# CS/B.Tech (ECE-OLD)/(Supple)/SEM-7/EC-701(0)/09 DIGITAL SIGNAL PROCESSING (SEMESTER - 7) 

1. $\qquad$
Signature of Invigilator

2. 

Reg. No.


Roll No. of the Candidate


> CS/B.Tech (ECE-OLD)/(Supple)/SEM-7/EC-701(0)/09 ENGINEERING \& MANAGEMENT EXAMINATIONS, JULY-2009 DIGITAL SIGNAL PROCESSING (SEMESTER - 7 )

Time : 3 Hours ]
[ Full Marks: 70

## INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of $\mathbf{3 2}$ pages. The questions of this concerned subject commence from Page No. 3.
2. a) In Group - A, Questions are of Multiple Choice type. You have to write the correct choice in the box provided against each question.
b) For Groups - B \& C you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of Group - B are Short answer type. Questions of Group - C are Long answer type. Write on both sides of the paper.
3. Fill in your Roll No. in the box provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, which will lead to disqualification.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided
FOR OFFICE USE / EVALUATION ONLY
Marks Obtained


Head-Examiner/Co-Ordinator/Scrutineer


# CS / B.Tech (ECE-OLD)/(Supple) / SEM-7/EC-701 (O)/09 DIGITAL SIGNAL PROCESSING <br> SEMESTER - 7 <br> Time : 3 Hours ] <br> [ Full Marks : 70 

## GROUP - A <br> ( Multiple Choice Type Guestions )

1. Choose the correct alternatives for any ten of the following :
i) Laplace transform of $\delta(n)$ equals to
a) 0
b) •
c) 1
d) cannot be determined.
$\square$
ii) If $y(n)=n x^{2}(n)$, the system is
a) linear and time variant
c) non-linear and time variant
b) linear and time invariant
d) non-linear and time invariant. $\square$
iii) If $x(n)=e^{2 n} u(n)$, the signal is
a) energy signal
b) power signal
c) energy signal but not power signal
d) neither energy signal nor power signal. $\square$
iv) Speed improvement factor of DFT and FFT with 64 point sequence is
a) 21.33b)
21.43
c) 21.09 d$)$
24.34.

v) FIR filter must be
a) unstable
b) stable
c) both (a) \& (b)
d) none of these.
$\square$
vi) No. of complex multiplications required to perform DFT is
a) $\quad N^{2} \log _{2} N$
b) $\frac{N^{2}}{2}$
c) $\quad 4 N^{2}$
d) $\quad \frac{\mathrm{N}}{2} \log _{2} N$.
vii) If $x(n)$ is a sequence of $L$ number of samples and $h(n)$ with $M$ number of samples, the convolution of $x(n)$ and $h(n)$ contain
a) $\quad \operatorname{Max}(L, M)$ samples
b) $\quad L+M-1$ samples
c) $L+M-2$ samples
d) $\quad L+M$ samples.
viii) The main advantage of FFT is
a) it reduces the computation time
b) it can be used for determining the filter output
c) used to evaluate the Fourier Transform of an digital hardware
d) all of these.
ix) An LTI system having transfer function $H(z)$ is stable if, and only if all the poles of $H(z)$ are
a) inside unit circle
b) outside unitcircle
c) all the unit circles
d) both (a) and (c).
x) For analyzing digital filter which of the following transforms is used?
a) Laplace transform
b) Fourier transform
c) Z-Transform
d) All of these.
$\square$
xi) FIR filters are
a) recursive
b) non-recursive
c) unstable
d) recursive and stable.
$\square$
xii) The condition for system stability is
a) $n=\cdot b$ )
$n=\bullet$
$\Sigma|h(n)|<-\cdot$
$\Sigma|h(n)|<0$
$n=-\bullet$
$n=-\cdot$
c) $n=\cdot d$ )
$n=\cdot$
$\Sigma|h(n)|>\cdot$
$\Sigma|h(n)|<\cdot$
$n=-\bullet$
$n=-\bullet$.
xiii) The condition to avoid aliasing is
a) $f_{s}<2 f_{m}$
b) $\quad f_{s}>2 f_{m}$
c) $f_{s} \leq 2 f_{m}$
d) $\quad f_{s} \geq 2 f_{m}$.
xiv) Is it possible to get linear convolution from circular convolution.?
a) Yes
b) $\quad \mathrm{No}$
c) May be
d) May not $b$ be.

xv) 'Twiddle factor' is used in
a) DFT
b) FFT
c) FIR filter designing
d) Z-transform.

## GROUP - B

## ( Short Answer Type Questions )

Answer any three of the following.
2. Find the cross-correlation of the following two finite length sequences :
$x(n)=\{1,2,1,1\}, y(n)=\{1,1,2,1\}$
3. Consider a causal and stable LTI system whose $i / p x(n)$ and $o / p y(n)$ are related to the second order difference equation :
$y(n)-\frac{1}{4} y(n-1)-\frac{1}{4} y(n-2)=x(n)$

Determine the impulse response $h(n)$ for the system.
4. Find the $Z$ transform of the signal :
$x(n)=\cos n \theta u(n)$
5. What is zero padding ? What is its use ?
6. Define Z-transform. What is meant by region of convergence ?

## GROUP - C

( Long Answer Type Questions )
Answer any three of the following.

7. By the following specifications as given, determine the order of filer using Chebyshev approximation. Find $H(s)$ :

$$
\begin{array}{ll}
\alpha_{p}=3 \mathrm{~dB}, & \alpha_{s}=16 \mathrm{~dB} \\
f_{p}=1 \mathrm{kHz} \quad \text { and } & f_{s}=2 \mathrm{kHz} .
\end{array}
$$

8. a) An analog filter has a transfer function

$$
H(S)=10 /\left(s^{2}+7 s+10\right)
$$

Design a digital filter equivalent to this impulse invariant method.
b) Determine $H(z)$ that results when the bilinear transform is applied to

$$
H_{a}(S)=\left(s^{2}+4.525\right) /\left(s^{2}+0.692 s+0.504\right) .
$$

9. a) What is signal flow graph ?
b) What do you mean by the transposition theorem and transposed structure ?
c) Determine the direct form II \& transposed direct form II for the given system :

$$
y(n)=\frac{1}{2} y(n-1)-\frac{1}{4} y(n-2)+x(n)+x(n-1) .
$$

10. a) What do you mean by the term 'window' in designing of EIR filter ?
b) Describe briefly about the windowing technique.
c) Name the different window methods available for designing of the FIR filter.
d) Describe in detail about any one type of window method.
11. Find the DFT of a sequence $x(n)=\{1,2,3,4,4,3,2,1\}$ by using
a) DIT algorithm

OR
b) DIF algorithm.

END

