B.TECH SEM – VI (2007 COURSE) (ELECTRONICS) :
WINTER - 2017
SUBJECT: DIGITAL SIGNAL PROCESSING

Day: Tuesday **Time:** 10.00 AM TO 01.00 PM
Date: 21/11/2017 **W-2017-2515** **Max. Marks: 80**

N.B:

1) **Q. No. 1** and **Q. No. 5** are **COMPULSORY.** Out of remaining questions attempt **ANY TWO** questions from each section.
2) Figures to the right indicate **FULL** marks.
3) Answer to both sections should be written in the **SEPARATE** answer book.

SECTION-I

Q.1 **a)** With illustrations explain shifting, folding and time scaling operations on discrete time signals. **(05)**

b) State the relationship between DTFT and DFT. **(05)**

c) Give the number of complex additions and complex multiplications required for the direct computation and FFT algorithm of 8 point DFT. **(04)**

Q.2 **a)** Show that the following system are non-linear and time invariant. **(07)**
i) $y(n)=x(n)+x(n)y(n-1)$
ii) $y(n+2)+2y(n)=x(n+1)+2$

b) What is meant by sampling? Draw the spectrum of a sampled signal and explain aliasing. **(06)**

Q.3 **a)** Find 4-point DFT of the sequence. **(07)**
$x(n)=\cos\left(\frac{n\pi}{4}\right)$; $N=4$

b) An FIR digital filter has unit impulse response sequence. $h(n)=\{2,2,1\}$. Determine the output sequence in response to the input sequence $x(n)=\{3,0,-2,0,2,1,0,-2,-1,0\}$ using overlap add convolution method. **(06)**

Q.4 **a)** Find inverse DFT of $X(K)=\{1,2,3,4\}$; $N=4$ **(07)**

b) Explain the Goertzel algorithm in detail. **(06)**

SECTION-II

Q.5 **a)** What are the desirable features of window functions? **(05)**

b) What is Kaiser window? In what way is it superior to other window functions? **(05)**

c) Discuss the stability of the impulse invariant mapping technique. **(04)**

Q.6 **a)** Determine the direct form I and II realization for a 3rd order IIR transfer function $H(Z)=\frac{0.28Z^2+0.319Z+0.04}{0.5Z^3+0.3Z^2+0.17Z-0.2}$ **(07)**

b) Explain in detail cascade form realization of FIR systems. **(06)**

P.T.O.

Q.7 **a)** A low pass filter is to be designed with the following desired frequency response $H_d(e^{j\omega})$ $\begin{cases} e^{-2j\omega}; & -\pi\vert 4 \le \omega \le \pi\vert 4 \\ 0 \ ; & \pi\vert 4 < \vert\omega\vert \le \pi \end{cases}$ **(07)**

Determine filter coefficients $h_d(n)$ if the $w(n) = \begin{cases} 1 & 0 \le n \le 4 \\ 0 & otherwise \end{cases}$

b) Name different types of window functions. Explain in brief. **(06)**

Q.8 **a)** Determine H (Z) using impulse invariance technique for the analog system function. $H(S) = \dfrac{(S+0.2)}{(S+0.2)^2+9}$ **(07)**

Assume T = 1sec.

b) Obtain mapping formula for the bilinear transformation method. **(06)**

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