B.Tech Sem – VI (2007 Course) (Electronics) : SUMMER - 2019
SUBJECT: DIGITAL SIGNAL PROCESSING

Day: Friday
Date 24/05/2019

Time: 02.30 PM TO 05.30 PM
Max. Marks: 80

S-2019-3123

N.B.:

1) Q. No. 1 and Q. No 5 are **COMPULSORY**. Out of the remaining attempt any **TWO** questions from each section
2) Figures to the right indicate **FULL** marks.
3) Answer to both the sections should be written in **SAME** Answer book.
4) Use of non-programmable **CALCULATOR** is allowed.
5) Assume suitable data if necessary.

SECTION-I

Q.1 **a)** With an example discuss in detail time invariance and stability properties of discrete time system. **(05)**

b) State and prove the periodicity property of DFT. **(05)**

c) Briefly explain the bit reversal w.r.t FFT. **(04)**

Q.2 **a)** With illustrations explain shifting, folding and time scaling operations performed on discrete time signals. **(07)**

b) Compute the linear convolution of the following sequences. **(06)**
x(n)=(1,1,1,1,1) h(n)=(1,-2,-3,4)

Q.3 **a)** Determine the inverse DFT of the following sequence: **(07)**
$X(k) = \{1, 2, 3, 4\}$

b) Derive the relationship between: **(06)**
i) Z transform and DFT ii) Fourier series and DFT

Q.4 **a)** Compute $X(k)$ using 8-point DIF – FFT algorithm for the given sequence. **(07)**
x (n) = { 1,1,1,0,0, 1,1,1}

b) Explain the Goertzel algorithm used to compute DFT. **(06)**

SECTION-II

Q. 5 **a)** Compare direct form I and direct form II realization of IIR systems. **(05)**

b) With neat diagram. Explain Gibb's phenomenon. **(05)**

c) What is meant by frequency warping? **(04)**

P. T. O.

Q.6 **a)** Determine the direct form –II realization for the following system **(07)**

$$y(n) = -0.1y(n-1) + 0.72y(n-2) + 0.7x(n) - 0.252x(n-2)$$

b) Obtain cascade realization of the system function **(06)**

$$H(z) = \left(1 + 2z^{-1} - z^{-2}\right)\left(1 + z^{-1} - z^{-2}\right)$$

Q.7 **a)** The desired frequency response of a LPF is **(07)**

$$H_d\left(e^{j\omega}\right) = 1; \begin{cases} 1; & \frac{-\pi}{2} \le \omega \le \frac{\pi}{2} \\ 0; & \frac{\pi}{2} \le \omega \le \pi \end{cases}$$

Determine $h_d(n)$ for M = 7 using a Hanning window.

b) Explain the design of FIR filters using frequency sampling method. **(06)**

Q.8 **a)** Explain impulse invariance method to design IIR filter. **(07)**

b) What are the requirements for converting stable analog filter into a stable digital filter? **(06)**

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