B.Tech Sem – VI (2007 Course) (Electronics) : WINTER - 2018

SUBJECT : DIGITAL SIGNAL PROCESSING

Day : Wednesday
Date : 14/11/2018

W-2018-2858

Time : 10.00 AM TO 01.00 PM
Max. Marks : 80

N. B. :

1) **Q. No. 1** and **Q. No. 5** are **COMPULSORY**. Out of remaining attempt **ANY TWO** questions from Section – **I** and Section – **II**.
2) Figures to the right indicate **FULL** marks.
3) Answers to both the sections should be written in the **SEPARATE** answer books.
4) Use of non-programmable calculator is **ALLOWED**.
5) Assume suitable data if necessary.

SECTION - I

Q. 1 **a)** Explain aliasing effect. **(05)**

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

c) What is need for FFT algorithm? State its computational complexity. **(04)**

Q. 2 **a)** Determine whether the following system is causal, linear, dynamic, time variant and stable: **(07)**

$$y(n) = x(n+3)$$

b) State and explain the properties of linear convolution. **(06)**

Q. 3 **a)** Compute 4 – point DFT of **(07)**

$$x(n) = \{1, 2, 3, 4\}$$
$$\uparrow$$

b) State and explain convolution property of DFT. **(06)**

Q. 4 **a)** Compute 8 – point DFT of a sequence using DIT-FFT algorithm **(07)**

$$x(n) = \{1, 2, 1, 2\}$$

b) Give computation efficiency of FFT over DFT. **(06)**

SECTION – II

Q. 5 **a)** What are the drawbacks of direct form realization of IIR systems? **(05)**

b) Briefly explain Gibb's phenomenon. **(05)**

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

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Q. 6 **a)** Obtain cascade realization of the system characterized by the transfer function. **(07)**

$$H(z) = \frac{2(z+2)}{z(z-0.1)(z+0.5)(z+0.4)}.$$

b) Draw and explain the direct form - I and direct form - II structures of IIR filter. **(06)**

Q. 7 **a)** Explain the procedure for designing an FIR filter using rectangular window. **(07)**

b) A filter is to be designed with the following desired frequency response : **(06)**

$$H_d(e^{j\omega}) = \begin{matrix} 0 & -\pi/4 \le \omega \le \pi/4 \\ -e^{-2j\omega} & \pi/4 \le |\omega| \le \pi \end{matrix}$$

Determine filter coefficients $h_d(n)$ if the window function is :

$$w(n) = \begin{matrix} 1 & 1 \le n \le 4 \\ 0 & otherwise \end{matrix}$$

Q. 8 **a)** Explain in detail impulse invariance method of IIR filter design. **(07)**

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

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