Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (ECE) (2012 to 2017) (Sem.–5)

DIGITAL SIGNAL PROCESSING

Subject Code : BTEC-502

M.Code : 70546

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt ANY FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt ANY TWO questions.**

SECTION-A

1. Write briefly :

a. Give the significance of ROC in Z-transform.

b. Determine whether the signal is periodic or non periodic also determine its fundamental period $x(n) = 3\cos\left(5n + \frac{\pi}{6}\right)$

c. Determine whether the system is linear or non-linear $y(n) = x(n^2)$.

d. What do you mean 'twiddle factor' of DFT & show how it is cyclic?

e. Explain the factors that influence the choice of specific structure for realization of a digital filter.

f. Compare the computational efficiency of FFT algorithms over the direct computation of DFT.

g. In the implementation of a digital system what are the effects of coefficient quantization?

h. Differentiate between FIR and IIR filter.

i. What are the desirable features of DSP processors?

j. Give the various steps involved in the design of FIR filter?

SECTION-B

2. Determine the response $y(n)$, $n \geq 0$, of the system described by the second order difference equation :

$y(n) - 3y(n-1) - 4y(n-2) = x(n) + 2x(n-1)$ to the input $x(n) = 4^n u(n)$

3. Determine and sketch the convolution $y(n)$of the following signals :

$$x(n) = \begin{cases} (0.5)^n, & 0 \le n \ge 4 \\ 0, & elsewhere \end{cases}$$

$$h(n) = \begin{cases} 1, & -1 \le n \ge 3 \\ 0, & elsewhere \end{cases}$$

4. State and prove the differentiation property of Z-transform.

5. Determine the Z-transform of the signal :

$x(n) = n^2u(n)$

6. Determine the causal signal $x(n)$ if its Z-transform X(z) given by

$$X(z) = \frac{2 - 1.5z^{-1}}{1 - 1.5z^{-1} + 0.5z^{-2}}$$

SECTION-C

7. a. Obtain the direct form–1, cascade & parallel structure for the following system

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

b. Draw the block diagram of ADSP 2181 processor. Explain the architectural features of this.

8. Compute the 8-point DFT of the sequence :

$$x(n) = \begin{cases} 1, & 0 \le n \le 2 \\ 2n, & 3 \le n \le 7 \\ 0 & otherwise \end{cases}$$

using the radix-2 decimation-in-time FFT algorithm.

9. Design the symmetric FIR low pass filter using hamming window, whose desired frequency response is given as,

$$H_d(\omega) = \begin{cases} e^{-j5\omega}, & -3\pi/4 \le \omega \le 3\pi/4 \\ 0, & 3\pi/4 \le |\omega| \le \pi \end{cases}$$

NOTE : Disclosure of identity by writing mobile number or making passing request on any page of Answer sheet will lead to UMC case against the Student.