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

Total No. of Questions : 09

B.Tech. (ECE) (Sem.–5)

DIGITAL SIGNAL PROCESSING

Subject Code : BTEC-502-18

M.Code : 78298

Date of Examination : 05-06-2023

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS 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) $x(n)=\cos 3\pi n$, determine whether the given signal is periodic or non-periodic, also compute the fundamental period.

b) Differentiate between energy and power signals.

c) Give the computational efficiency of FFT over DFT.

d) State the convolution property of Z-transform.

e) How the stability of the linear time variant system is calculated?

f) What are the advantages of representing the digital filter in the block diagram form?

g) What do you mean by truncation and rounding errors?

h) Give the four properties of ROC.

i) What is meant by frequency warping? What is the cause of this effect?

j) What is the need of Multirate Signal Processing?

SECTION-B

2. Compute the convolution $y(n)=h(n)*x(n)$ for the values of $x(n)$ and $h(n)$ as given below

   $x(n)=(1/2)^n u(n)$ and $h(n)=(1/4)^n u(n)$

3. Determine the Z-transform and sketch the ROC of:

$$x(n) = \left(\frac{1}{2}\right)^n [u(n) - u(n - 10)].$$

4. Determine the inverse z-transform of the following function

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

For ROC *:* $|z| > 1$ and *ROC :* $|z| < 0.5$.

5. The system function of the analog filter is given as

$$H_a(S) = \frac{s + 0.1}{(s = 0.1)^2 + 9}$$

Obtain the system function of IIR digital filter by using impulse invariance method.

6. Obtain the direct form-1, cascade & parallel structure for the following system

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

SECTION-C

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

$$H_d(\omega) = \begin{cases} e^{-j\omega\tau} & for\ |\omega| \le \omega_c \\ 0 & otherwise \end{cases}$$

   The length of the filter should be 9 and $\omega_c = 1$ radian/sample.

8. With the help of N=8, explain radix-2 Decimation-In-Time (DIT) FFT algorithm for computation of DFT.

9. With the help of a block diagram, explain the architecture of a TMS processor.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.