Reg. No. : | | | | | | | | | | | | |

# Question Paper Code : 50483

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017
Fourth Semester
Electrical and Electronics Engineering
EE 6403 – DISCRETE TIME SYSTEMS AND SIGNAL PROCESSING
(Common to : Electronics and Instrumentation Engineering, Instrumentation and Control Engineering)
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. State the Parseval's theorem for discrete time signal.
2. What is meant by aliasing effect ?
3. List the methods to find inverse Z transform.
4. Write the conditions to define stability in ROC.
5. Find the DFT of the signal $x(n) = a^n$.
6. Draw the butterfly structure for 2 point DFT using DIT – FFT algorithm.
7. Draw the direct form I structure for 3rd order system.
8. What is prewarping effect ?
9. Write the features of DSP processor.
10. List some example of commercial digital signal processor.

PART – B (5×13=65 Marks)

11. a) i) Determine the power and energy of the given signal. State the signal is power or energy $x(n) = \sin\left(\frac{\pi n}{4}\right)$. (4)

ii) Determine the given signal is periodic or not $x(n) = \cos\left(\frac{2\pi n}{3}\right)$. (3)

iii) Discuss the mathematical representation of signal. Write the difference between continuous and discrete time signal. (6)

(OR)

b) i) Determine whether the system is linear or not $y(n) = ax(n) + bx(n-1)$. (3)

ii) Determine whether the given system is causal or not $y(n) = x(n) + x^2(n-1)$. (4)

iii) Determine whether the system is time invariant and stability : $y(n) = e^{x(n)}$. (6)

12. a) i) State and prove any three properties of Z transform. (8)

ii) Find the Z transform of $x(n) = r^n \cos(n\theta)\, u(n)$. (5)

(OR)

b) i) A discrete system has a unit sample response

$h(n) = \frac{1}{2}\partial(n) + \partial(n-1) + \frac{1}{2}\partial(n-2)$. Find the system frequency response. (7)

ii) Find the convolution of the two sequences $x(n) = \{1, 2, -1, 1\}$ and $h(n) = \{1, 0, 1, 1\}$ using graphical method. (6)

13. a) i) State and prove any two properties of DFT. (6)

ii) Determine the DFT of the following sequence $x(n) = \{5, -1, 1, -1, 2\}$. (7)

(OR)

b) Find the DFT of a sequence $x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$ using DIT – FFT algorithm. (13)

14. a) Obtain an analog Chebyshev filter transfer function that satisfies the given constraints

$$\frac{1}{\sqrt{2}} \le |H(j\Omega)| \le 1; \quad 0 \le \Omega \le 2$$
$$|H(j\Omega)| < 0.1; \quad \Omega \ge 4$$

(13)

(OR)

b) Design an ideal lowpass FIR filter with a frequency response.

$$H_d(e^{j\omega}) = 1 \text{ for } -\frac{\pi}{2} \le \omega \le \frac{\pi}{2}$$
$$= 0 \text{ for } \frac{\pi}{2} \le \omega \le \pi$$

Find the values of h(n) for N = 11. Find H(z). Assume rectangular window. **(13)**

15. a) Draw the architecture of TMS320C50 and explain its functional units. **(13)**

(OR)

b) Explain the classification of instructions in DSP processor with suitable examples. **(13)**

PART – C **(1×15=15 Marks)**

16. a) Design Butterworth filter using the impulse invariance method for the following specifications :

$$0.8 \le |H(e^{j\omega})| \le 1 \quad , \quad 0 \le \omega \le 0.2\pi$$
$$|H(e^{j\omega})| \le 0.2 \quad , \quad 0.6\pi \le \omega \le \pi$$

Realize the designed filter using direct form II structure. **(15)**

(OR)

b) i) How mapping from S-domain to Z-domain is achieved in bilinear transformation. **(8)**

ii) Apply Bilinear transformation to $H(S) = \frac{2}{(S+1)(S+2)}$. **(7)**