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

Question Paper Code : X65624

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Fifth/Sixth Semester
Electrical and Electronics Engineering
080280051 – DIGITAL SIGNAL PROCESSING
(Regulations 2008)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. A two tone signal has 50 Hz and 75 Hz tones. If this signal is digitally processed, what would be minimum sampling frequency required to avoid aliasing ?

2. If the output of a system y(n) is represented as $y(n) = x(n) - 0.5\, y(n-1)$, classify the system whether it is recursive or not. Justify your answer.

3. What do you mean by region of convergence in Z-transform ?

4. Determine the Fourier transform of the signal $x(n) = \left(\frac{1}{2}\right)^{|n|}$.

5. Compute the DFT of $x(n) = \delta(n - n_0)$.

6. What is meant by radix – 2 FFT ?

7. How many multiplications and additions are involved in radix – 2 FFT algorithm ?

8. What is 'Gibbs' phenomenon ?

9. List any four applications of DSP processor.

10. What does circular buffer and barrel shifter do ?

PART – B **(5×16=80 Marks)**

11. a) i) If the relationship between the input x(n) and output y(n) of a system is given, how the classification of the system is carried out under linearity, time invariance, causality, recursive and stability. **(8)**

ii) Classify the system described by y(n) = x(n) – 2x(n – 1) + 0.5 y (n – 1) + n under the above mentioned categories. **(8)**

(OR)

b) i) Write the impulse, step and ramp signals in terms of other. **(6)**

ii) Find the x and differentiation of the signal x(n) shown in Fig Q. 11 (b). **(4)**

iii) Write signal x(n) and signals identified in (ii) in terms of impulse, step and ramp signals. **(6)**

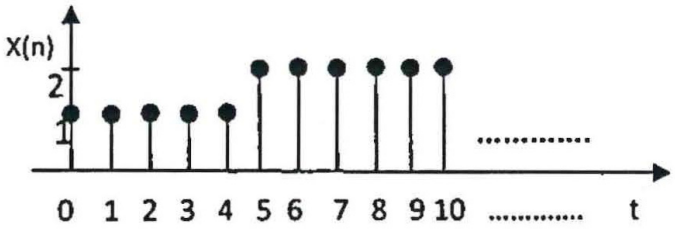

Fig Q. 11 (b).

12. a) Determine the convolution of the following pairs of signals by means of the Z-transform.

i) $x_1(n) = \left(\frac{1}{4}\right)^n u(n-1), x_2(n) = \left[1 + \left(\frac{1}{2}\right)^n\right] u(n)$. **(8)**

ii) $x_1(n) = nu(n)$, $x_2(n) = 2^n u(n-1)$. **(8)**

(OR)

b) Determine the Fourier transform of the following signals and plot the magnitude response.

i) $x_1(n) = u(n)$. **(8)**

ii) $x_1(n) = (\cos \omega_0 n)\, u(n)$. **(8)**

13. a) i) Find the IDFT of X(k) = {5, 0, 1 – j, 0, 1, 0, 1 + j, 0}. **(8)**

ii) Explain any three properties of DFT. **(8)**

(OR)

b) i) Compute the 4-point DFT of x(n) = {1, 2, 3, 4}. **(8)**

ii) Explain Multi resolution Analysis in wavelet context. **(8)**

14. a) Design an IIR Butterworth digital low pass filter satisfying the following specification. **(16)**

Sampling time = 1 sec

PB frequency = 0.055 π rad/sec

SB frequency = 0.65 rad/sec

PB Attenuation = 7 dB

SB Attenuation = 25 dB.

(OR)

b) Design an FIR digital filter with

$$H_d(e^{j\omega}) = e^{-j5\omega}; \quad -\pi/2 \le \omega \le \pi/2$$
$$= 0; \qquad \pi/2 < \omega \le \pi$$

Using Blackman window with N = 11. **(16)**

15. a) Differentiate Van Neumann and Harvard architecture and briefly explain the ALU and memory unit of TMS320C54. **(16)**

(OR)

b) List any four DSP specific instructions used in digital signal processor and explain them with suitable examples. **(16)**

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