DSP

Important Questions for Semester

Chapter-1 (Each carrying 2 marks) Short question

1. Name the basic elements of a digital signal processing system.
2. Define multichannel & multidimensional signal.
3. Define continuous time & discrete time signal.
4. Define Sampling theorem.
5. What do you mean by symmetric signal?
6. What do you mean by quantization of a sinusoidal signal?
7. Define energy & power signal.
8. Write four operations that are performed on discrete time signals.
9. What do you mean by Nyquist rate?
10. Differentiate symmetric & antisymmetric signal.
11. What is antialiasing filter?
12. Write the basic parts of analog to digital converter / digital to analog converter.

Long question

1. Write the advantage of digital signal processing over analog signal processing.
2. Discuss the properties of a discrete time sinusoidal signal & continuous time sinusoidal signal.
3. Define the following discrete time signal & show its graphical representation.
   - i) Unit Sample Sequence
   - ii) Unit Step Sequence
   - iii) Unit ramp Sequence
   - iv) Exponential Signal
4. Describe the basic parts of Analog to Digital (A/D) Converter.
5. With a neat block diagram explain different parts of digital to analog Converter.
6. Consider the analog signal $x_a(t) = 3\cos 50\pi t + 10\sin 300\pi t - \cos 100\pi t$

   what is the Nyquist rate of the signal?

7. Consider the analog signal

$$x_a(t) = 3\cos 200\pi t + 5\sin 600\pi t + 10\cos 1200\pi t$$

what is the Nyquist rate for this signal.

8. ~~With a need block diagram explain dif~~
8. State & explain Sampling th^m.
9. Define energy & power signal. Determine the value of power & energy of the signal.

$$x(n) = \left(\frac{1}{3}\right)^n u(n)$$

Chapter-2

Short question

1. what is discrete time signal.
2. what is a static system.
3. Define discrete time signal & system.
4. Show the graphical representation of $u(n+2)$.
5. Define FIR & IIR system.
6. Define linear & Non-linear systems.
7. what do you mean by recursive system.
8. Define causal versus Non-Causal system.
9. State recursive versus non-recursive system.
10. what is a dynamic system.
11. what is periodic signal & Aperiodic signal.

Long question

1. Determine if the following systems are causal or non-causal.

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

ii) $y(n) = x(n^2)$

2. a) Define time variant & time invariant systems.

b) Determine whether the following system is time-variant or time invariant

i) $y(n) = n\,x(n)$

ii) $y(n) = \cos x(n)$

iii) $y(n) = e^{x(n)}$

3. Define discrete time system classify & explain discrete time system.

4. Draw the block diagram of discrete time system described by the I/P - O/P relⁿ $y(n) = \frac{1}{4}y(n-1) + \frac{1}{2}x(n) + \frac{1}{2}x(n-1)$

5. Determine the following system are time Variant or time Invariant.

a) $y(n) = n\,x(n)$

b) $y(n) = x(-n)$

c) $y(n) = x(n) + x(n-1)$

d) $y(n) = x(-n)$

6. Determine if the following systems are Linear or Non-Linear.

i) $y(n) = n\,x(n)$

ii) $y(n) = x(n^2)$

7. What are deterministic & Non-deterministic signal.

Chapter-3

1. Define region of Convergence.

2. Define z-transform.

3. Explain various properties of z-transform

4. Explain poles & zeros. Determine the pole zero plot for the signal $x(n) = a^n u(n)$.

5. Find the z-transform of $x(n)$, of the signal $x(n) = a^n u(n) + b^n u(-n-1)$

6. State & explain inverse z-transform. Determine the z-transform of $X(z) = \frac{1}{1 - 1.5z^{-1} + 0.5z^{-2}}$

7. Determine the z-transform & ROC of the signal

$$x(n) = (\cos \omega_0 n)\,u(n)$$

8. Determine the pole & zero for the signal.

$$x(n) = n\,a^n u(n)$$

9. Find the inverse Z-transform

i) $X(z) = \frac{z(z^2 - 4z + 5)}{(z-3)(z-1)(z-2)}$ for ROC $|z| > 3$

ii) $X(z) = \frac{1 + 3z^{-1}}{1 + 3z^{-1} + 2z^{-2}}$ $|z| > 2$

10. Find the z-transform of i) $x(n) = \cos n\Omega \cdot u(n)$

ii) $x(n) = \left(\frac{1}{3}\right)^{n-1} u(n-1)$

11. Find the inverse z-transform of

$$X(z) = \frac{z^2 + 2}{(z-2)(z-5)} \quad \text{for } |z| > 5$$

12. Determine the z-transform of the signal

$$x(n) = [3(2)^n - 4(3)^n] u(n)$$

13. Determine the z-transform & ROC of the following finite duration of the signals $x(n) = \{1, 2, 3, -1, 2, 3, 4\}$ (↑ at 1)

14. By using partial fraction expansion method find the inverse z-transform of $H(z) = \frac{z^2 - 3z + 8}{(z-2)(z+2)(z+3)}$

15. Determine the z-transform & ROC of the following eqn

$$x(n) = r^n \cos n\, u(n)$$

16. Find the z-transform & ROC of the signal.

$$x(n) = -b^n u(-n-1)$$

17. If a system is described by the difference eqn

$$y(n) = -\sum_{k=1}^{N} a_k y(n-k) + \sum_{k=0}^{M} b_k x(n-k).$$

Determine $H(z)$.

18. Find the impulse response of the system described by differential eqn $y(n) - 5y(n-1) + 6y(n-2) = x(n)$ using z-transform.

Chapter-4

① Define DFT.

② what is zero padding.

③ Discuss the properties of DFT.

4. Find the 4 point DFT of the sequence $x(n) = \{2, 0, 1, 0\}$

5. Compute 8-point DFT of the sequence

$$x(n) = \begin{cases} (-1)^n, & 0 \le n \le 8 \\ 0, & \text{otherwise} \end{cases}$$

6. Write the relⁿ ~~between~~ of DFT to Z-transform.

7. Define IDFT

8. Differentiate betⁿ circular convolution & linear convolution.

9. Obtain the circular convolution of the following sequences

$$x_1(n) = \{2, 4, -1, 2\}$$
$$x_2(n) = \{-1, 4, 2, -3\}$$

using concentric circle method.

10. Two finite duration sequences are

$$h(n) = \{1, 0, 1\} \text{ & } x(n) = \{-1, 2, -1, 0, 1, 3, -2, 1, -3, -2, -1, 0, -2\}$$

use overlap add method for finding $y(n) = x(n) * h(n)$

11. State & explain ~~discrete~~ DTFT.

12. Find the circular convolution of two finite duration

~~Chapter-5~~

1.

$$x_1(n) = \{1, -1, 2, 3, -1\}$$
$$x_2(n) = \{1, 2, 3\}$$

13. Find the IDFT of $X(k) = \{3, 2+j, 1, 2-j\}$

Chapter-5 short question

1. Define FFT.
2. What is the advantage of FFT.?
3. How many complex multiplications & complex additions are required to find out N-point DFT using FFT algorithm.
4. What do you mean by radix-2 algorithm?
5. What is the number of real multiplications & real additions required to complete N-point DFT.
6. What is the difference betn DIT & DIF algorithms?
7. Draw the basic butterfly of DIT radix-2 FFT algorithm.
8. Draw the basic butterfly of DIF FFT algorithm?
9. Define twiddle factor.

Long question

1. Write down the ~~advantage~~ algorithm of DIF-FFT.
2. Compute 4-point DFT of the following sequences using DIF algorithm
$$x(n) = \{4, 5, 1, 2\}$$
3. Compute the 4-point DIT-FFT of the following sequence
$$x(n) = \{0, 2, 4, 3\}$$
4. Write down the algorithm of DIT-FFT.
5. Compute the 8-point DFT of the sequence $x(n) = \{2,2,2,2,1,1,1,1\}$ using DIT FFT algorithm.
6. Find the 8-point DFT of the sequence $x(n) = \{1,1,1,1,1,1,1,1\}$ using DIF algorithm.