EC 8352-SIGNALS AND SYSTEMS
UNIT-I
CLASSIFICATION OF SIGNALS AND SYSTEMS
PART-A

1. Define Signal.

A signal is a function of one or more independent variables which contain some information.

Eg: Radio signal, TV signal, Telephone signal etc.

2. Define System.

A system is a set of elements or functional block that are connected together and produces an output in response to an input signal.

Eg: An audio amplifier, attenuator, TV set etc.

3. Define CT signals.

Continuous time signals are defined for all values of time. It is also called as an analog signal and is represented b y x (t).

Eg: AC waveform, ECG etc.

4. Define DT signal.

Discrete time signals are defined at discrete instances of time. It is represented by x(n).

Eg: Amount deposited in a bank per month.

5. Give few examples for CT signals.

AC waveform, ECG, Temperature recorded over an interval of time etc.

6. Give few examples of DT signals.

Amount deposited in a bank per month,

7. Define unit step, ramp and delta functions for CT.

Unit step function is defined as U(t)= 1 for t >= 0
0 otherwise

Unit ramp function is defined as r(t)=t for t>=0
0 for t<0

Unit delta function is defined as d(t)= 1 for t=0
0 otherwise

8. State the relation between step, ramp and delta functions(CT).

The relationship between unit step and unit delta function is d(t)= u(t)
The relationship between delta and unit ramp function is d(t).dt = r(t)

9. State the classification of CT signals.

The CT signals are classified as follows

(i) Periodic and non periodic signals
(ii) Even and odd signals
(iii) Energy and power signals
(iv) Deterministic and random signals.

10. Define deterministic and random signals.

A deterministic signal is one which can be completely represented by Mathematical equation at any time. In a deterministic signal there is no uncertainty with respect to its value at any time.

Eg: x(t)=cos wt, x(n)=2 pft

A random signal is one which cannot be represented by any mathematical equation.

Eg: Noise generated in electronic components, transmission channels, cables etc.

11. Define power and energy signals.

The signal x(t) is said to be power signal, if and only if the normalized average power p is finite and non-zero. i.e. 0<p< 4

A signal x(t) is said to be energy signal if and only if the total normalized energy is finite and non-zero. i.e. 0<E< 4

12. Compare power and energy signals.

Sl. No.	Power Signal	Energy Signal
1	The normalized average power is finite and non-zero	Total normalized energy is finite and non- zero
2	Practical periodic signals are power signals	Non-periodic signals are energy signals

13.Define odd and even signal.

A DT signal x(n) is said to be an even signal if x(-n)=x(n) and an odd signal if x(-n)=-x(n).

A CT signal is x(t) is said to be an even signal if x(t)=x(-t) and an odd signal if x(-t)=-x(t).

14. Define periodic and Aperiodic signals.

A signal is said to be periodic signal if it repeats at equal intervals. Aperiodic signals do not repeat at regular intervals.

A CT signal which satisfies the equation x(t)=x(t+T) is said 0 to be periodic and a DT signal which satisfies the equation x(n)=x(n+N)is said to be periodic.

15. State the classification or characteristics of CT and DT systems.

The DT and CT systems are according to their characteristics as follows

(i). Linear and Non-Linear systems
(ii). Time invariant and Time varying systems.
(iii). Causal and Non causal systems.
(iv). Stable and unstable systems.
(v). Static and dynamic systems.
(vi). Inverse systems.

16. Define linear and non-linear systems.

A system is said to be linear if superposition theorem applies to that system. If it does not satisfy the superposition theorem, then it is said to be a nonlinear system.

17. Define Causal and non-Causal systems.

A system is said to be a causal if its output at anytime depends upon present and past inputs only.

A system is said to be non-causal system if its output depends upon future inputs also.

18. Define time invariant and time varying systems.

A system is time invariant if the time shift in the input signal results in corresponding time shift in the output.

A system which does not satisfy the above condition is time variant system.

19. Define stable and unstable systems.

When the system produces bounded output for bounded input, then the system is called bounded input, bounded output stable.

A system which does not satisfy the above condition is called unstable system.

20. Define Static and Dynamic system.

A system is said to be static or memory less if its output depends upon the present input only.

The system is said to be dynamic with memory if its output depends upon the present and past input values.

21. What is superposition property?

If an input consists of the weighted sum of several signals, then the output is the superposition that is, the weighted sum of the responses of the system to each of those signals.

22. Define a causal system?

The causal system generates the output depending upon present &past inputs only. A causal system is non anticipatory.

23. Define invertible system?

A system is said to be invertible if the input is get from the output input. Otherwise the system is noninvertible system.

PART-B

1. Discuss the classification of DT and CT signals with examples.

- Deterministic and random signals
- Periodic and Aperiodic signals

ower signals

- Noise signals
- Physically Realisable & non-realisable signals.

2. Discuss the classification of DT and CT systems with examples.

- Linear and Non-Linear systems
- Time invariant and Time varying systems
- Causal and Non-causal systems
- Stable and unstable systems
- Static and dynamic systems
- Inverse systems

3. Problems on the properties & classifications of signals & systems

Find whether the following signals are periodic or not

a. x(t)=2cos(10t+1)-sin(4t-1)

b. x(t)=3cos4t+2sin pφ

4. Check whether the following system is

1. Static or dynamic
2. Linear or non-linear
3. Causal or non-causal
4. Time invariant or variant

y(n)=sgn[x(n]

UNIT II
ANALYSIS OF CONTINUOUS TIME SIGNALS
PART-A

1.Define CT signal

Continuous time signals are defined for all values of time. It is also called as an analog signal and is represented by x (t).

Eg: AC waveform, ECG etc.

2. Compare double sided and single sided spectrums.

The method of representing spectrums of positive as well as negative frequencies are called double sided spectrums.

The method of representing spectrums only in the positive frequencies is known as single sided spectrums.

3. Define Quadrature Fourier Series.

Consider x(t) be a periodic signal. The Fourier series can be written for this signal as follows

$$x(t)= a + n8=1.\ a_n cosw_0 nt + .\ 8n=1\ b\ sinw_0 nt$$

This is known as Quadrature Fou rier Series.

4.Define polar Fourier Series.

$$x(t)= D_0 + n8=1\ D_n cos((2\ pnt / T) +$$

The above form of representing a signal is known as Polar Fourier series.

5.Define exponential Fourier series.

$$x(t)= 8n=1\ C_n\ e\ j2pnt / T0$$

The method of representing a signal by the above form is known as exponential fourier series.

6. State Dirichlets conditions.

(i).The function x(t) should be single valued within the interval T_0

(ii). The function x (t) should have atmost a finite number of discontinuities in the interval T_0

(iii). The function x(t) should have finite number of maxima and minima in the interval T_0

(iv). The function should have absolutely integrable.

7. State Parsevals power theorem.

Parsevals power theorem states that the total average power of a periodic signal x(t) is equal to the sum of the average powers of its phasor components.

8.Define Fourier Transform.

Let x(t) be the signal which is the function of time t. The fourier transform of x(t) is given by

$$X(w)= x(t)e^{-jwt}\ dt$$

9. State the conditions for the existence of Fourier series.

(i). The function x(t) should be single valued in any finite time interval T

(ii). The function x(t) should have atmost finite number of discontinuities in any finite time interval T.

(iii). The function x(t) should have finite number of maxima and minima in any time interval T.

(iv) The function x(t) should be absolutely integrable.

10. Find the Fourier transform of function x(t)= d**(t)**

Ans: 1

11. State Rayleigh's energy theorem.

Rayleigh's energy theorem states that the energy of the signal may be written in frequency domain as superposition of energies due to individual spectral frequencies of the signal.

12.Define Laplace transform.

Laplace transform is the another mathematical tool used for analysis of continuous time signals and systems. It is defined as

$$F(s) = f(t)\ e^{-st}\ dt$$

13. Obtain the Laplace transform of ramp function.

Ans: $1/s^{2}$

14. What are the methods for evaluating inverse Laplace transform?

The two methods for evaluating inverse Laplace transform are

(i). By Partial fraction expansion method.

(ii). By convolution integral.

15. State initial value theorem.

X(s), then value of x(t)is geven as,

x(0+) = lim t->0+ [sX(s)]

provided that the first derivative of x(t) should be Laplace transformable.

16. State final value theorem.

If x(t) and X(s) are Laplace transform pairs, then the final value of x(t) is given as ,
Lim t->4 x(t)= Lim s->0 [sX(s)]

17. State the convolution property of Fourier transform.

If x1(t) and x1(f) are Fourier transform pairs and x2(t) and x2(f) are Fourier transform pairs, then x1(t)x 2(f- t)d t is Fourier transform pair with X1(f)X2(f)

18. What is the relationship between Fourier transform and Laplace transform.

X(s)=X(jw) when s=jw

This states that laplace transform is same as fourier transform when s=jw.

19.Find the fourier transform of sgn function.

Ans: 2/j

20. Find out the laplace transform of f(t)=e ^{at} ….

Ans: 1/(s-a)

21. What are the types of Fourier series?

i. Exponential Fourier series

ii. Trigonometric Fourier series

22. Write down the exponential form of the fourier series representation of aperiodic signal?

$x(t)= \sum a_k . e^{jk \omega o t}$

Here the summation is taken from - ∞ to ∞.

$a_k =1/T\int x(t)e^{- jk \omega o t}$

Here the integration is taken from 0 to T.

The set of coefficients { ak } are often called the fourier series co efficient or spectral coefficients. The coefficient a_o is the dc or constant component of x(t).

23. What is the use of Laplace transform?

Laplace transform is an another mathematical tool used for analysis of signals and systems. Laplace transform is used for analysis of unstable systems.

24. What are the types of Laplace transform?

i. Bilateral or two sided Laplace transform.

ii. Unilateral or single sided Laplace transform.

25. Define Bilateral and unilateral Laplace transform?

The bilateral laplace transform is defined as

$$X(s)= \int x(t)e^{-st}dt$$

Here the integration is taken from - ∞ to ∞. Hence it is called bilateral Laplace transform

The unilateral laplace transform is defined as

$$X(s)= \int x(t)e^{-st}dt$$

Here the integration is taken from 0 to ∞. Hence it is called unilateral Laplace transform.

26. Define inverse Laplace transform?

trans form is given as

$x(t)=1/2\pi j\int X(s)\, e^{st}ds$

Here the integration is taken from σ-j∞ to σ+j∞.

PART-B

1.State and prove properties of fourier transform.

- Linearity property
- Shifting property
- Frequency shifting
- Differentiation in time domain
- Integration in time domain
- Convolution in time domain

2. State the properties of Fourier Series.

- Linearity property
- Shifting property
- Convolution in time domain
- Multiplication in time domain
- Duality property
- Parsevals theorem

3. State the properties of Laplace transform.

- Linearity property
- Shifting property
- Complex translation
- Differentiation in time domain
- Integration in time domain
- Initial value theorem
- Final value theorem
- Convolution in time domain

4. Problems on Fourier series, Fourier transform and Laplace transform.

5. State and prove parsevals power theorem and Rayleigh's energy theorem.

UNIT- III

LINEAR TIME INVARIANT – CONTINUOUS TIME SYSTEMS

PART-A

1. Define LTI-CT systems.

In a continuous time system if the time shift in the input signal results in the corresponding time shift in the output, then it is called the LTI-CT system

2. What are the tools used for analysis of LTI-CT systems?

The tools used for the analysis of the LTI-CT system are

- Fourier transform
- Laplace transform

3.Define convolution integral.

f two s ignals is given by

y(t)= x(t)*h(t)

where

x(t)*h(t)= x(t)h(t- t).d

This is known as convolution integral.

4.List the properties of convolution integral.

a. commutative property
b. distributive property
c. associative property
d. shift property
e. convolution with an impulse
f. width property

5.State commutative property of convolution .

The commutative property of convolution states that

x1(t)*x2(t)=x 2(t)*x1(t)

6.State the associative property of convolution .

Associative property o f convolution states that

x1(t)*[x2(t)*x3(t)]=[x1(t)*x2(t)] *x 3

7.State distributive property of convolution .

The distributive property states that

x1(t)*[x2(t)+x 3(t)]=x1(t)*x2(t)+x1(t)*x3(t)

8 . When the LTI-CT system is said to be dynamic?

In LTI CT system, the system is said to be dynamic if the present output depends only on the present input.

9. When the LTI-CT system is said to be causal?

An LTI continuous time system is causal if and only if its impulse response is zero for negative values of t.

10. When the LTI-CT system is said to be stable?

A LTI-CT system is said to be stable if the impulse response of the system is absolutely integrable. That is

h(t) < 4

11. Define natural response.

Natural response is the response of the system with zero input. It depends on the initial state of the system. It is denoted by y n (t)

12. Define forced response.

Forced response is the response of the system due to input alone when the initial state of the system is zero. It is denoted by y f(t).

13. Define complete response.

The complete response of a LTI-CT system is obtained by adding the natural response and forced response.

y(t)= y n (t)+ y f (t)

14 . Draw the direct form I implementation of CT systems.

15. Draw the direct form II implementation of CT systems.

16. Mention the advantages of direct form II structure over direct form I structure.
No.of integrators are reduced to half
17. Define Eigen function and Eigen value.
In the equation given below,

$$y(t)=H(s)e^{st}$$

H(s) is called Eigen value and e^{st} is called Eigen function.
18. Define Causality and stability using poles.
For a system to be stable and causal, all the poles must be located in the left half of the s plane.
19. Find the impulse response of the system y(t)=x(t-t 0) using Laplace transform .
Ans:

$$h(s)= d\ (t-t_0)$$

20. The impulse response of the LTI CT system is given as h(t)=e -t u(t). Determine transfer function and check whether the system is causal and stable.
Ans:

$$H(s)=1/(s+1)$$

The system is causal, stable.
21. State the significance of block diagram representation.
The LTI systems are represented with the help of block diagrams. The block diagrams are more effective way of system description. Block Diagrams indicate how individual calculations are performed. Various blocks are used for block diagram representation.

PART-B

1. State and prove the properties of convolution sum?

- Commutative property of convolution x(n) * h(n) = h(n) * x(n)= y(n)
- Associative property of convolution [x(n) * h1(n)]* h2(n) = x (n) * [h1(n)*h2(n)]
- Distributive property of convolution X(n)*[h1(n) + h2(n)] = x(n) * h1(n) + x(n) * h2(n)

2. Determine the convolution of x(n) = {1,1,2} h(n)=u(n) graphically.
3. Determine the forced response for the following system y(n)-1 y(n-1) -1 y(n-2) = x(n)+ x(n-1) for x(n) =(1/8)n u(n), Assume zero initial conditions.
4. Compute the response of the system y(n) = 0.7 u(n-1) – 0.12 y(n-2) + x(n-2) to the input x(n) = n u(n). Is the system is stable?
5. Derive the 8 point DIT and DIF algorithms.

UNIT-IV
ANALYSIS OF DISCRETE TIME SIGNALS
PART-A

1. Define DTFT.

Let us consider the discrete time signal x(n).Its DTFT is denoted as X(w). It is given as $X(w)= x(n)e^{-jwn}$

2. State the condition for existence of DTFT?

The conditions are

• If x(n)is absolutely summable then

|x (n) |<

• If x(n) is not absolutely summable then it should have finite energy for DTFT to exit.

3. List the properties of DTFT.

- Periodicity
- Linearity
- Time shift
- Frequency shift
- Scaling
- Differentiation in frequency domain
- Time reversal
- Convolution
- Multiplication in time domain
- Parseval's theorem

4. What is the DTFT of unit sample?

The DTFT of unit sample is 1 for all values of w.

5. Define DFT.

DFT is defined as $X(w)= x(n)e^{-jwn}$. Here x(n) is the discrete time sequence X(w) is the Fourier transform of x(n).

6. Define Twiddle factor.

The Twiddle factor is defined as $W N=e^{-j2 /N}$

7. Define Zero padding.

The method of appending zero in the given sequence is called as Zero padding.

8. Define circularly even sequence.

A Sequence is said to be circularly even if it is symmetric about the point zero on the circle.

$$x(N-n)=x(n),1<=n<=N-1.$$

9. Define circularly odd sequence.

A Sequence is said to be circularly odd if it is anti symmetric about point x(0) on the circle

10. Define circularly folded sequences.

A circularly folded sequence is represented as $x((-n))_N$. It is obtained by plotting x(n) in clockwise direction along the circle.

11. State circular convolution.

This property states that multiplication of two DFT is equal to circular convolution of their sequence in time domain.

12. State parseval's theorem.

Consider the complex valued sequences x(n) and y(n).If x(n) ---- X(k), y(n) ---- Y(k) then x(n)y*(n)=1/N X(k)Y*(k)

13. Define Z transform.

The Z transform of a discrete time signal x(n) is denoted by X(z) and is given by $X(z)= x(n)Z^{-n}$.

14. Define ROC.

The value of Z for which the Z transform converged is called region of convergence.

15. Find Z transform of x(n)={1,2,3,4}

x(n)= {1,2,3,4}

$X(z)= x(n)z^{-n}$

$= 1+2z^{-1} +3z^{-2} +4z^{-3}$.

$= 1+2/z+3/z^{2}+4/z^{3}$.

16. State the convolution property of Z transform.

The convolution property states that the convolution of two sequences in time domain is equivalent to multiplication of their Z transforms.

17. What z transform of (n-m)?

By time shifting property

$Z[A (n-m)]=AZ^{-m}$ sinZ[(n)] =1

18. State initial value theorem.

If x(n) is causal sequence then its initial value is given by x(0)=lim X(z)

19. List the methods of obtaining inverse Z transform.

Inverse z transform can be obtained by using

- Partial fraction expansion.
- Contour integration
- Power series expansion
- Convolution.

20. Obtain the inverse z transform of X(z)=1/z-a,|z|>|a|

Given $X(z)=z^{-1} /1-a^{z-1}$

By time shifting property

$X(n)=a^{n} .u(n-1)$

21. What are the Properties of ROC.

i. The ROC of a finite duration sequence includes the entire z plane, except z= 0 and |z|=∞

not contain any poles.

iii. ROC is the ring in the z-plane centered about origin.
iv. ROC of causal sequence (right handed sequence) is of the form |z| r.
v. ROC of left handed sequence is of the form |z| < r.
vi. ROC of two sided sequence is the concentric ring in the z plane.

22. State the methods to find inverse Z transform.

a. Partial fraction expansion
b. Contour integration
c. Power series expansion
d. Convolution method.

23. What is meant by sampling?

A sampling is a process by which a CT signal is converted into a sequence of discrete samples with each sample representing the amplitude of the signal at the particular instant of time.

24. State Sampling theorem?

A band limited signal of finite energy, which has no frequency components higher than the W hertz, is completely described by specifying the values of the signal at the instant of time separated by 1/2W seconds and A band limited signal of finite energy, which has no frequency components higher than the W hertz, is completely recovered from the knowledge of its samples taken at the rate of 2W samples per second.

25. What is meant by aliasing?

When the high frequency interferes with low frequency and appears as low then the phenomenon is called aliasing.

26. What are the effects aliasing?

Since the high frequency interferes with low frequency then the distortion is generated. The data is lost and it cannot be recovered.

27. How the aliasing process is eliminated,

i). Sampling rate $f_s \geq 2W$.
ii). Strictly band limit the signal to ‘W’. This can be obtained by using the Low pass filer before the sampling process. It is also called as anti-aliasing filter.

28. Define Nyquist rate and Nyquist interval.

When the sampling rate becomes exactly equal to ‘2W’samples/sec, for a given bandwidth of W hertz, then it is called Nyquist rate.Nyquist interval is the time interval between any two adjacent samples.

Nyquist rate = 2W Hz
Nyquist interval = 1/2W seconds.

29. Define sampling of band pass signals.

A band pass signal x(t) whose maximum bandwidth is ‘2W’ can be completely represented into and recovered from its samples, if it is sampled at the minimum rate of twice the band width.

PART-B

1. Derive the convolution integral and also state and prove the properties of the same.
2. Explain the properties of LTI CT system interms of impulse response.
3. Problems on properties of LTI CT systems.
4. Problems on differential equations.
5. Realization of LTI CT system using direct form I and II structures.
6. Finding frequency response using Fourier methods.

Steps:

- Take Fourier transform for the given differential equations.
- Find system transfer function H(w)
- The frequency response can be obtained from the transfer function by separating the real and imaginary parts.

7. Solving differential equations using Fourier methods.

Steps:

- Take Fourier transform for the given differential equation.
- Then find Y(s) using the given initial conditions.
- Then find y(t) by taking inverse Fourier transform.

8. Solving differential equations using Laplace methods.

Steps:

- Take Laplace transform for the given differential equation.
- Then find Y(s) using the given initial conditions.
- Then find y(t) by taking inverse Laplace transform.

9. Obtaining state variable description.

Steps:

- The state variable description consists of differential equations that describe state of the system.
- The output of the system is related to current state and input.
- The state is the minimal set of signals that represent systems entire pass memory.
- The state equations for LTI CT system can be written as d/dt[q(t)] = A q(t) + b x(t), y(t) = cq(t) + D x(t) hence A,b,c, D are the matrices representing internal structure of the system.

UNIT-V
LINEAR TIME INVARIANT DISCRETE TIME SYSTEMS
PART-A

1. Define convolution sum?

If x(n) and h(n) are discrete variable functions, then its convolution sum y(n) is given by,

$$y(n)= x(k)\ h(n-k)$$

2. List the steps involved in finding convolution sum?

- Folding
- Shifting
- Multiplication
- Summation

3.List the properties of convolution?

- Commutative property of convolution

$$x(n) * h(n) = h(n) * x(n) = y(n)$$

- Associative property o f convolution

$$[\ x(n) * h_1(n)] * h_2(n) = x(n) * [h_1(n) * h_2(n)]$$

- Distributive property of convolution

$$x(n) * [h_1(n) + h_2(n)] = x(n) * h_1(n) + x(n) * h_2(n)$$

4. Define LTI causal system?

A LTI system is causal if and only if ,h(n) = 0 for n<0.This is the sufficient and necessary condition for causality of the system.

5. Define LTI stable system?

The bounded input x(n) produces bounded output y(n) in the LTI system only if, |h(k)| <8. When this condition is satisfied, the system will be stable.

6. Define FIR system?

The systems for which unit step response h(n) has finite number of terms, they are called Finite Impulse Response (FIR) systems.

7. Define IIR system?

The systems for which unit step response h(n) has infinite number of terms, they are called Infinite Impulse Response (IIR) systems.

8. Define non recursive and recursive systems?

When the output y(n) of the system depends upon present and past inputs then it is called non-recursive system.

When the output y(n) of the system depends upon present and past inputs as well as past outputs, then it is called recursive system.

9. State the relation between Fourier transform and z transform?

The Fourier transform is basically the z-transform of the sequence evaluated on unit circle.
i.e., $X(z)|\ z=e^{j} = X(\ )$ at $|z|=1$ i.e., unit circle.

10. Define system function?

H(z)= Y(z) is called system function.It is the z transform of the unit Sample X(Z) response h(n) of the system.

11. What is the advantage of direct form 2 over direct form 1 structure?

The direct form 2 structure has reduced memory requirement compared to direct form 1 structure.

12. List the applications of FFT?

- Filtering
- Spectrum analysis
- Calculation of energy spectral density

15. How unit sample response of discrete time system is defined?

The unit step response of the discrete time system is output of the system to
Unit sample sequence. i.e., T[ð(n)]=h(n). Also h(n)=z {H(z)}.

16.A causal DT system is BIBO stable only if its transfer function has __________.

Ans:A causal DT system is stable if poles of its transfer function lie within
The unit circle

17. If u(n) is the impulse response response of the system, What is its step response?

Here h(n) = u(n) and the input is x(n) = u(n).
Hence the output y(n) = h(n) *x(n)
= u(n) * u(n)

18.Convolve the two sequences x(n)={1,2,3} and h(n)={5,4,6,2}

Ans: y(n)={5,14,29,26,22,6}

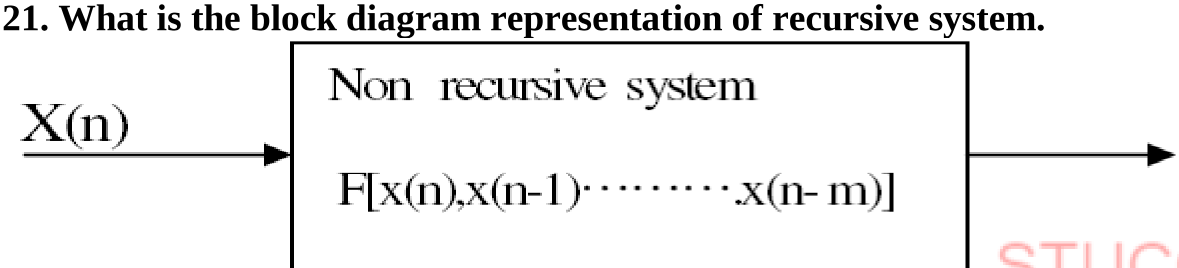
19. State the maximum memory requirement of N point DFT including twiddle factors?

Ans: [2N+N/2]

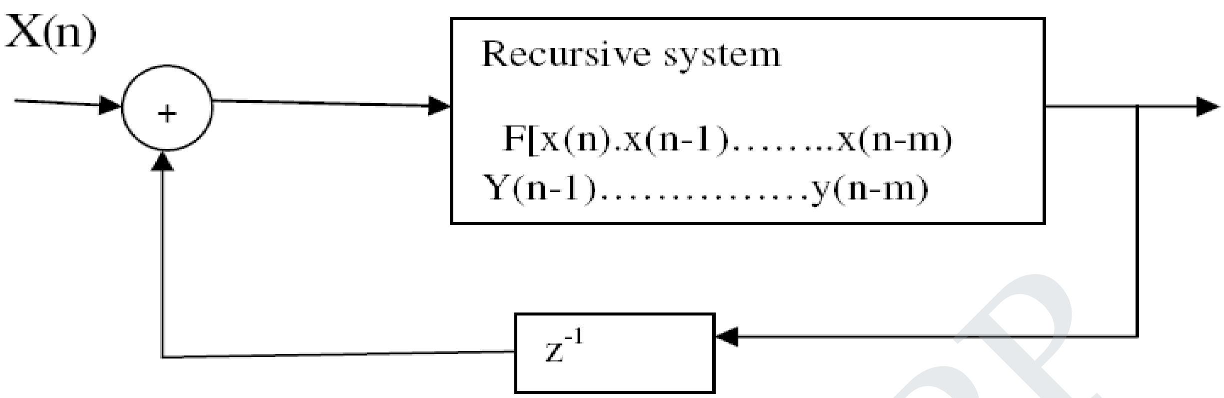
20.Determine the range of values of the parameter 'a' for which the linear time invariant system with impulse response $h(n)=a^{n}u(n)$ is stable?

Ans: H(z)= z , There is one pole at z=a. The system is stable, if all its poles. z-a i.e., within the unit circle. Hence $|a| < 1$ for stability.

21. What is the block diagram representation of recursive system.



22. What is the block diagram representation of non recursive system.



23. What is the difference between recursive and non recursive system Non recursive system?

A recursive system have the feedback and the non recursive system have no feedback.

And also the need of memory requirement for the recursive system is less than non recursive system.

24. Define realization structure.

The block diagram representation of a difference equation is called realization structure. These diagram indicate the manner in which the computations are performed.

25. What are the different types of structure realization.

i. Direct form I
ii. Direct form II
iii. Cascade form
iv. Parallel Form.

PART-B

1. State and prove properties of DTFT

- Periodicity
- Linearity
- Time shift
- Frequency shift
- Scaling
- Differentiation in frequency domain
- Time reversal
- Convolution
- Multiplication in time domain
- Parseval's theorem.

2. State and prove the properties of DFT.

- Periodicity

- Circular symmetries of a sequence
- Symmetry properties
- Circular convolution
- Time reversal of a sequence
- Circular time shift of a sequence
- Circular frequency shift
- Complex conjugate properties
- Circular correlation
- Multiplication of two sequences
- Parsevals theorem

3. State and prove the properties of z transform.

- Linearity
- Time shifting
- Scaling in z domain
- Time reversal
- Differentiation in z domain
- Convolution in time domain
- Correlation of two sequences
- Multiplication of two sequences
- Conjugation of a complex sequence
- Z transform of real part of the sequence
- Z transform of imaginary part of the sequence
- Parsevals relation
- Initial value theorem

4. Find the DFT of x(n)={1,1,1,1,1,1,0,0}

5. Find the circular convolution of x 1 (n)={1,2,0,1} X 2 (n)={2,2,1,1}

6. Problems on z transform and inverse z transform.

EC 8392-Digital Electronics

PART – A (2 MARKS)

UNIT – I

DIGITAL FUNDAMENTALS

1) Define binary logic?

Binary logic consists of binary variables and logical operations. The variables are designated by the alphabets such as A, B, C, x, y, z, etc., with each variable having only

es: 1 and 0. There are three basic logic operations: AND, OR, and NOT.