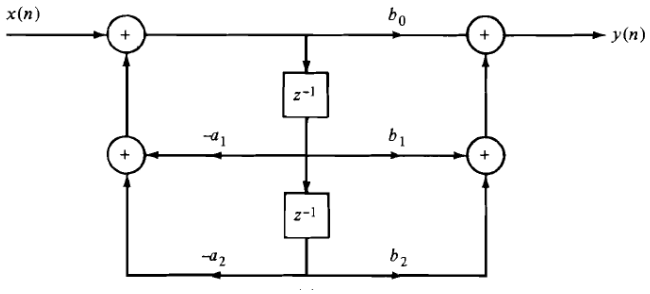
MODULE 1: Discrete Time Signals and Systems

1	The system described by the equation y(n)=ay(n-1)+b x(n) is a recursive system. a)True b)False	
2	Which of the following linear time invariant system is a purely recursive system? a) $y(n)= -\sum_{k=1}^{N} a_k y(n-k)+\sum_{k=0}^{M} b_k x(n-k)$ b) $y(n)= \sum_{k=1}^{N} a_k y(n-k)+\sum_{k=0}^{M} b_k x(n-k)$ c) $y(n)= -\sum_{k=1}^{N} a_k y(n-k)-\sum_{k=0}^{M} b_k x(n-k)$ d) $y(n)= -\sum_{k=1}^{N} a_k y(n-k)+b_0 x(n)$	
3	Which of the following is the difference equation of a special case of FIR system? a) $y(n)= \sum_{k=0}^{M} b_k x(n-k)$ b) $y(n)= a_0 y(n)-\sum_{k=1}^{N} a_k y(n-k)$ c) $y(n)= -\sum_{k=1}^{N} a_k y(n-k)$ d)None of the mentioned	
4	The system described by the equation y(n)=ay(n+1)+b x(n) is a recursive system. a) True b) False	**Mark 1**
5	**A discrete time signal may be** 1) Samples of a continuous signal 2) A time series which is a domain of integers 3) Time series of sequence of quantities 4) Amplitude modulated wave	
6	Define energy and power signal.	
7	Define periodic and aperiodic signal.	
8	Define dynamic and static system.	
9	Define time variant and time invariant system.	
10	State properties of ROC.  	**Mark 3**
11	Find the fundamental period of the signal $x(n) = 3\, e^{j3\Pi(n+1/2)}$	**Mark 2**
12	Is the system y(t) = y(t-1) + 2t y(t-2) time invariant ?	

13	Check Whether the given system is causal and stable. y (n) = 3 x (n - 2) + 3 x (n + 2)	
14	What is the periodicity of x(t) = $e^{j100\Pi t}$ + 30^o ?	
15	What is an anti-aliasing filter?	
16	To implement the linear time invariant recursive system described by the difference equation $y(n)= -\sum_{k=1}^{N} a_k y(n-k)+\sum_{k=0}^{M} b_k x(n-k)$ Equation in Direct form-I, how many number of delay elements and multipliers are required respectively?	**Mark 5**
17	**Find the convolution of the signals** x(n) = 1 n=-2,0,1 = 2 n=-1 = 0 elsewhere	
18	**Determine the solution of the difference equation** y(n) = 5/6 y(n-1) – 1/6 y(n-2) + x(n) for x(n) = 2^nu(n)	
19	Determine the response y(n), n>=0 of the system described by the second order difference equation y(n) – 4y(n-1) + 4y(n-2) = x(n) – x(n-1) when the input is x(n) = $(-1)^n$u(n) and the initial condition are y(-1) = y(-2)=1.	
20	Is a discrete time signal described by the input output relation y[n]= r^n x[n] time invariant.	

MODULE 2: Discrete Time Fourier Transform(DTFT), Z- Transforms, Discrete Fourier Transform, Fast Fourier Transforms

1	What is the Fourier series representation of a signal x(n) whose period is N? a) $\sum_{k=0}^{N+1} c_k e^{j2\pi kn/N}$ b) $\sum_{k=0}^{N-1} c_k e^{j2\pi kn/N}$ c) $\sum_{k=0}^{N} c_k e^{j2\pi kn/N}$ d) $\sum_{k=0}^{N-1} c_k e^{-j2\pi kn/N}$	
2	Which of the following represents the phase associated with the frequency component of discrete-time Fourier series (DTFS)? a)$e^{j2\pi kn/N}$ b)$e^{-j2\pi kn/N}$ c)$e^{j2\pi knN}$ d) None of the mentioned	

3	What are the Fourier series coefficients for the signal x(n)=cosπn/3? a)c1=c2=c3=c4=0,c1=c5=1/2 b)c0=c1=c2=c3=c4=c5=0 c)c0=c1=c2=c3=c4=c5=1/2 d) None of the mentioned	**Mark 1**
4	What is the equation for average power of discrete time periodic signal x(n) with period N in terms of Fourier series coefficient ck? a) $\sum_{k=0}^{N-1} \lvert c_k \rvert$ b) $\sum_{k=0}^{N-1} \lvert c_k \rvert^2$ c) $\sum_{k=0}^{N} \lvert c_k \rvert^2$ d) $\sum_{k=0}^{N} \lvert c_k \rvert$	
5	What is the Fourier transform X(ω) of a finite energy discrete time signal x(n)? a) $\sum_{n=-\infty}^{\infty} x(n)e^{-j\omega n}$ b) $\sum_{n=0}^{\infty} x(n)e^{-j\omega n}$ c) $\sum_{n=0}^{N-1} x(n)e^{-j\omega n}$	
6	If all the poles of H(z) are inside the unit circle, then the system is said to be: a) Only causal b) Only BIBO stable c) BIBO stable and causal d) None of the mentioned	
7	What is the energy of a discrete time signal in terms of X(ω)? a) $2\pi \int_{-\pi}^{\pi} \lvert X(\omega) \rvert^2 \, d\omega$ b) $\frac{1}{2\pi} \int_{-\pi}^{\pi} \lvert X(\omega) \rvert^2 \, d\omega$ c) $\frac{1}{2\pi} \int_{0}^{\pi} \lvert X(\omega) \rvert^2 \, d\omega$	
8	A linear time invariant system is said to be BIBO stable if and only if the ROC of the system function: a) Includes unit circle b) Excludes unit circle c) Is an unit circle d) None of the mentioned	
9	If x(n) is a stable sequence so that X(z) converges on to a unit circle, then the complex spectrum signal is defined as: a) X(ln X(z)) b) ln X(z) c) X^{-1}(ln X(z)) d) None of the mentioned	

10	If the ROC of the system function is the exterior of a circle of radius $r < \infty$, including the point $z = \infty$, then the system is said to be: a) Stable b) Causal c) Anti causal d) None of the mentioned	
11	If cx(n) is the complex cepstrum sequence obtained from the inverse Fourier transform of ln X(ω), then what is the expression for cθ(n)?	**Mark 2**
12	A linear time invariant system is characterized by the system function $H(z)=1/(1-0.5z^{-1})+2/(1-3z^{-1})$.What is the h(n) if the system is stable?	
13	What is the Fourier transform of the signal x(n)=u(n)? a) $\frac{1}{2\sin(\frac{\omega}{2})}e^{j(\omega+\pi)}$ b) $\frac{1}{2\sin(\frac{\omega}{2})}e^{j(\omega-\pi)}$ c) $\frac{1}{2\sin(\frac{\omega}{2})}e^{j(\omega+\pi)/2}$ d) $\frac{1}{2\sin(\frac{\omega}{2})}e^{j(\omega-\pi)/2}$	
14	What is the value of $X_R(\omega)$ given $X(\omega)=1/(1-ae^{-j\omega})$,$\lvert a\rvert<1$?	
15	What is the value of $\lvert X(\omega)\rvert$ given $X(\omega)=1/(1-ae^{-j\omega})$,$\lvert a\rvert<1$?	
16	If x(n)=A, -M<n<M, then what is the Fourier transform of the signal? =0, elsewhere	
17	If X(ω) is the Fourier transform of the signal x(n), then what is the Fourier transform of the signal x(n-k)?	**Mark 5**
18	What is the energy density spectrum of the signal $x(n)=a^nu(n)$, $\lvert a\rvert<1$?	
19	Determine the 8-Point IDFT of the Sequence x(n)={5,0,1-j,0,1,0,1+j,0}	
20	Determine the 8-Point DFT of the Sequence x(n)={1,2,3,4,4,3,2,1}	
21	Determine the 8-Point DFT of the Sequence x(n)={1,1,1,1,1,1,1,1}	
22	Determine the 8-Point DFT of the Sequence x(n)={1,1,1,1,1,1,0,0}	
23	Find the left sided z-transform of the given sequence x[n]={2,4,-6,3,8,-2}	
24	Determine the z-transform of the signal $x(n) = -a^nu(-n-1)$ & plot the ROC. Solution	
25	Consider an LTI system with difference equation y(n)- 3/4 y(n-1)+1/8 y(n-2) = 2x(n). Find H (z).	
26	How the stability of a system can be found in z-transform?	
27	Find the system function and the impulse response of the system Described by the difference equation,	

	y(n) = x(n)+2x(n-1)-4x(n-2)+x(n-3) Solution	
28	What is the transfer function of a system whose poles are at -0.3±j0.4 and a zero at -0.2	
29	Find the left sided z-transform of the given sequence x[n]={2,4,-6,3,8,-2} Solution	**Mark 3**
30	What is the relationship between the z-transform and Fourier Transform	
31	Determine the z-transform of unit step sequence	
32	Define two sided sequence (or) signal	
33	What are left sided sequence and right sided sequence	
34	How many multiplications and additions are required to compute N point DFT using redix-2 FFT?	
35	Distinguish between linear convolution and circular convolution of two sequences.	
	What are differences between overlap-save and overlap-add methods	
36	Define Nyquist rate and Nyquist interval	
37	State and prove the time shifting property of z-transform	
38	Difference between DFT & IDFT	
39	How will you express IDFT in terms of DFT.	
40	A linear time invariant system is characterized by the system function H(z)=1/(1-$0.5z^{-1}$)+2/(1-$3z^{-1}$).What is the ROC of H(z) if the system is causal?	

	MODULE 3: Filter design	
1	Which of the following is introduced in the frequency sampling realization of the FIR filter? a) Poles are more in number on unit circle b) Zeros are more in number on the unit circle c) Poles and zeros at equally spaced points on the unit circle d) None of the mentioned	
2	Why is it desirable to optimize frequency response in the transition band of the filter? a)Increase side lobe b)Reduce side lobe c)Increase main lobe d) None of the mentioned	
3	What is the equation for the frequency ωk in the frequency response of an FIR filter? a) $\frac{\pi}{M}(k+\alpha)$ b) $\frac{4\pi}{M}(k+\alpha)$ c) $\frac{8\pi}{M}(k+\alpha)$ d) $\frac{2\pi}{M}(k+\alpha)$	**Mark 1**

4	To reduce side lobes, in which region of the filter the frequency specifications has to be optimized? a) Stop band b) Pass band c) Transition band d) None of the mentioned	
5	In the frequency sampling method for FIR filter design, we specify the desired frequency response Hd(ω) at a set of equally spaced frequencies. a) True b) False	
6	I I R digital filters are of the following nature a. Recursive b. Non Recursive c. Reversive d. Non Reversive	
7	In I I R digital filter the present output depends on a. Present and previous Inputs only b. Present input and previous outputs only c. Present input only d. Present Input, Previous input and output	
8	Give the equation for the order of N and cut-off frequency Ωc of butter worth filter	**Mark 3**
9	What are the properties of the bilinear transformation?	
10	Write a short note on pre-warping	
	Mention any two techniques for digitizing the transfer function of an analog filter	
11	Compare IIR and FIR filters	
12	What is bilinear transformation?	
13	What is meant by fixed point number?	**Mark 2**
14	Give the square magnitude function of Butterworth filter	
15	State the limitations of impulse invariance mapping technique	
16	What is the main disadvantage of direct form-I realization	
17	Compare Butterworth & Chebyshev filter	
18	What is Warping effect?	**Mark 5**
19	**What is the criterion for the system to possess BIBO stability?**	
20	Write down the steps for designing a Butterworth filter?	
21	Write the steps in designing chebyshev filter?	
22	How can you design a digital filter from analog filter?	

SUBJECT DETAILS					
Course	Stream	Semester	Subject	Paper Code	Chapter
B.Tech	EE	6th	Digital Signal Processing	EE 605A	5[3 module]

PAPER SETTER DETAILS			
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Total No of Question	
1 Mark Question	22
2 Mark Question	16
3 Mark Question	20
5 Mark Question	22