Model Question Paper – 1/2 with effect from 2022-23 (CBCS Scheme)

USN: _____

Fifth Semester B.E. Degree Examination

Subject Title: Digital Signal Processing-BEI503

Time: 03 hours **Max. Marks: 100**

Note: 01. Answer any FIVE full questions, choosing at least ONE question from each MODULE.

02.

03.

		Module – 1	* Bloom's Taxonomy Level	COs	Marks
Q. 01	a	Describe the basic elements of DSP with suitable block diagram	1	1	5
	b	x(n) = (1,2,3,4). Plot x(n), x(2n), 2x(n), -x(n), x(-n), -x(-n), x(n+1) and x(n-1).	2	1	5
	c				
OR					
Q. 02	a	Explain sampling, aliasing and reconstruction	1	1	6
	b	Find out whether the DTS equation y(n)=ax(n)+b is static, time-invariant, linear and causal system.	2	1	4
	c		2	1	
Module – 2					
Q. 03	a	Find the convolution of the sequences x(n)=[1,2,3,4] and h(n)=[1,1,1,1] using graphical method.	1	2	6
	b	Determine the correlation of the sequences x(n)=[1,2,3,4] and y(n)=[5 ,6,7,8]	2	2	4
	c				
Q. 04	a	State and prove the time reversal and linear convolution properties in Z domain..	1	2	4
	b	Determine the z-transform of the signal 1. $x[n]=[3(2^n)-4(3^n)]u[n]$ 2. $x[n]=(\cos w_0 n)u[n]$	2	2	6
	c		2	2	
Module – 3					
Q. 05	a	State and prove the linearity, time shifting and frequency shifting properties of DFS	2	3	6
	b	Find the frequency response of 1. x(n)=u(-n) and 2. $x(n) = e^{i\omega n}$	1	3	4
	c				
OR					
Q. 06	a	State and prove the properties of DTFT	2	3	6
	b	Find the DTFT of the equation $x(n) = a^n u(n)$ and $x(n) = a^n u(-n-1)$	1	3	4
	c				
Module – 4					
Q. 07	a	Find the 3 point DFT of x(n)=[1,2 3]	2	3	4
	b	State and prove the DFT symmetry property for real, imaginary, real and even, real and odd, imaginary and even & imaginary and odd sequence.	1	3	6
	c				
OR					
Q. 08	a	Find N point DFT of the following sequences: 1. x(n)=u(n)-u(n-n0) 2. $x(n) = e^{i\omega n}$	2	3	4
	b	Find the 8 point DIF FFT of the sequence x(n)=[1 1 1 1]	2	3	6
	c				

Module – 5					
Q. 09	a	Write low pass filter specifications with suitable graph and equations	1	4	3
	b	Design low pass Butterworth filter using bilinear transformation method for satisfying the following constraints. Pass band frequency 0.162 rad., stop band frequency 1.63 rad., pass band ripple 3 dB., stop band attenuation 30 dB., and sampling frequency is 8kHz.	3	4	7
	c				
OR					
Q. 10	a	Tabulate the window characteristics	1	4	2
	b	Design low pass FIR filter for N=4 and cutoff frequency = 4 radians.	3	4	8
	c				

*** Bloom's Taxonomy Level: Indicates as L1, L2, L3, L4, etc. it is also desirable to indicate Cos and POs to be attained by every bit of question.**

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		Module – 1	* Bloom's Taxonomy Level	COs	Marks
Q. 01	a	Explain the steps for converting Analog to digital domain	1	1	4
	b	State and explain the sampling theorem and aliasing. Find the sampling frequency of the equation $s(t) = 10\sin 300\pi t - \cos 100\pi t$	2	1	6
	c				
OR					
Q. 02	a	Explain the classification of signals	1	1	2
	b	$y(n) = x^2(n)$. find linearity, time variance, causality and stability	2	1	4
	c	x(n) = (2,3,4,2). Find the odd and even component, periodicity and fundamental period and energy and power of x(n)	2	1	4
Module – 2					
Q. 03	a	Find the linear convocation of x(n)= (1, 1, 1) = h (n)	1	2	5
	b	Determine the circular convolution of the sequences x(n)=[1,2,3,4,5] and y(n)=[9,,8,7,6,5] using graphical method	2	2	5
	c				
OR					
Q. 04	a	State and prove linearity and time shift and time advance properties of Z transform.	1	2	2
	b	Find the Z transform of following sequences: 1. x(n)=u(-n) and 2. $x(n) = e^{i\omega n}$	2	2	4
	c	Determine the z-transform of the signal 1. $x[n]=-a^n u[-n-1]$ 2. $x[n]=(\cos w_0 n)u[n]$	2	2	4
Module – 3					
Q. 05	a	Find the DFS of the equations $x(n) = a^n u(n)$ and $x(n) = a^n u(n-1)$	2	3	4
	b	State and prove the linearity, time shifting and frequency shifting properties of DFS	1	3	6
	c				
OR					
Q. 06	a	Find the frequency response of $h(n) = 4\delta(n) + 2\delta(n-1) + 4\delta(n-2)$	2	3	4
	b	State and prove any three properties of DTFS	1	3	6
	c				
Module – 4					
Q. 07	a	Find the DFT of $x(n-5)$ and δ(n)	2	3	4
	b	State and prove the DFT symmetry property for real, imaginary, real and even, real and odd, imaginary and even & imaginary and odd sequence.	1	3	6
	c				
OR					
Q. 08	a	Determine the 5 point DFT of x(n)=[1,2,3]	2	3	4

	b	Compute 8 point DIT-FFT for x(n) = [1, 1, 1, 1]	2	3	6
	c				
Module – 5					
Q. 09	a	Write the equations of Hamming and Hanning windows in time domain and frequency domain	1	4	2
	b	Design low pass Butterworth filter using impulse invariance method for satisfying the following constraints. Pass band frequency 0.162 rad., stop band frequency 1.63 rad., pass band ripple 3 dB., stop band attenuation 30 dB., and sampling frequency is 8kHz.	3	4	8
	c				
OR					
Q. 10	a	Tabulate the differences between FIR and IIR filters.	1	4	2
	b	Design FIR LPF filter for N=5 and cutoff frequency 0.5 radians for Hanning window.	3	4	8
	c				

*** Bloom's Taxonomy Level: Indicates as L1, L2, L3, L4, etc. it is also desirable to indicate Cos and POs to be attained by every bit of question.**

5th sem Model QP

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