Dayananda Sagar College of Engineering

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(Accredited by National Assessment & Accreditation Council (NAAC) with 'A' grade)

Department of Electronics & Communication Engg.

Continuous Internal Evaluation – II

Course Name : Digital Signal Processing
Course Code : 18EC5DCDSP
Semester : 5
Max Marks : 50 M

Date : 09.11.2020
Day : Monday
Timings : 01.00 to 2.30pm
Duration : 1½ Hrs.

			Marks	CO & Levels
Q1	(a)	The computational procedure for Decimation in frequency algorithm takes i)Log_2 N stages ii) $2Log_2$ N stages iii) Log_2 N2 stages iv) Log_2 N/2 stages	1	
	(b)	The IIR filter designing involves i) Designing of analog filter in analog domain and transforming into digital domain ii) Designing of digital filter in analog domain and transforming into digital domain iii) Designing of analog filter in digital domain and transforming into analog domain iv) Designing of digital filter in digital domain and transforming into analog domain	1	
	(c)	What is the duration of the unit sample response of a ideal digital filter? i) Finite ii) Infinite iii) Impulse(very small) iv) Zero	1	
	(d)	Which among the following represent/s the characteristic/s of an ideal filter?i) Constant gain in passband ii) Zero gain in stop band iii) Linear Phase Responseiv) All of the above	1	
	(e)	The I I R filter design method that overcomes the limitation of applicability to only Lowpass filter and a limited class of bandpass filters is i) Approximation of derivatives ii) Impulse Invariance iii) Bilinear Transformation iv) Frequency sampling	1	
	(f)	The nonlinear relation between the analog and digital frequencies is called i)aliasing ii)warping iii) prewarping iv) antialiasing	1	
	(g)	FIR filters _____ 1)are non-recursive 2) do not adopt any feedback 3) are recursive 4) use feedback i)1&2 ii)3&4 iii)1&3 iv)2&4	1	
	(h)	In the frequency response characteristics of FIR filter, the number of bits per coefficient should be _____in order to maintain the same error. i) Increased ii) Constant iii) Decreased iv) None of the above	1	
	(i)	Which of the following condition should the unit sample response of a FIR filter satisfy to have a linear phase? i) h(M-1-n) n=0,1,2…M-1 ii) ±h(M-1-n) n=0,1,2…M-1 iii) -h(M-1-n) n=0,1,2…M-1 iv) None of the mentioned	1	
	(j)	If M and N are the orders of numerator and denominator of rational system function respectively, then how many additions are required in direct form-I realization of that IIR filter? i) M+N-1 ii) M+N iii) M+N+1 iv) M+N+2	1	
Q2		Design a butterworth digital filter with bandpass filter of passband and stop band attenuation -3dB and -10dB respectively. The passband cutoff frequencies are 300Hz and 1600Hz.The sampling frequency is 5000Hz. Use i) Bilinear Transformation	10	CO/L
Q3	(a)	Compare the bartlett window and hamming window	2	
	(b)	A lowpass filter is to be designed with the following desired frequency response	8	

$$H_d\left(e^{j\omega}\right) = H_d(\omega) = \begin{cases} e^{j2\omega} & |\omega| < \frac{\Pi}{4} \\ 0 & \frac{\Pi}{4} < |\omega| < \Pi \end{cases}$$

Determine the filter coefficients $h_d(n)$ and h(n)

if w(n) is a rectangular window defined as follows.

$$w_R(n) = \begin{cases} 1, & 0 \le n \le 4 \\ 0, & Otherwise \end{cases}$$

Also, find the frequency response, H(ω) of the resulting

FIR filter

Q4	(a)	Design an analog butterworth filter to meet the following specifications Passband Gain of -2dB, Passband edge frequency is 20rad/sec, stop band attenuation of 10dB and stop band edge frequency is 30rad/sec	7
	(b)	Let $H(s)=\frac{1}{s^2+s+1}$ represents the transfer function of a low pass filter with a passband of 1 rad/sec. Use the frequency transformations to find the transfer function of highpass filter with a passband frequency of 1rad/sec and A bandstop filter with a stopband of 2 rad/sec and a center frequency of 10 rad/sec	3
		OR	
Q5	(a)	The impulse response of a linear phase FIR filter starts at the values h(0)=1, h(1)=3, h(2)=-2. For N being odd and even, find the coefficients of the smallest order FIR filter that satisfies the linear phase condition	2
	(b)	Obtain the coefficients of an FIR filter to meet the specifications given below using the Hamming window. Passband edge frequency:1.5KHz, Stopband edge frequency: 2KHz, Minimum stopband attenuation: 50dB and Sampling frequency:8KHz(find minimum 5 h(n) coefficients)	8
Q6		Find the convolution of x(n)={1,2,1,0,} and h(n)={1,0,3,0} using radix-2 DIF-FFT algorithm	10
		OR	
Q7		Draw the block diagrams of direct form-I and direct form-II realizations for a digital IIR filter described by the system function:$H(z)=\frac{8z^3-4z^2+11z-2}{(z-\frac{1}{4})(z^2-z+\frac{1}{2})}$	10

Staff:STM/KSG/CU/KP