RV Educational Institutions ®
RV College of Engineering ®

Autonomous Institution Affiliated to Visvesvaraya Technological University, Belagavi

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Academic year 2022-2023 (OddSem)

DEPARTMENT OF

ELECTRONICS & COMMUNICATION ENGINEERING

Date	Feb 2023	Maximum Marks	60
Course Code	18EC55	Duration	120 Min
Sem	V Semester	Test-III	

DIGITAL SIGNAL PROCESSING AND MACHINE LEARNING

Note: Butterworth & Chebyshev tables are permitted

S. No	Questions (PART-A)	M	BT	CO
1	Let pass band frequency is 4KHz, stop band frequency is 5 kHz and sampling frequency = 80 kHz. Obtain the order of the FIR filter using hamming window. 31	1	2	2
2	The Bartlett window coefficient w(3) of Type 1(Symmetric Odd) FIR filter whose slope is 3 given by_____ 1	1	2	1
3	Find the order of a Chebyshev-1 filter having following specification. N=5 Pass band gain of -2dB at 1rad/sec and stopband attenuation of 20dB at 1.3rad/sec.	1	2	4
4	For a 3rd order low pass Chebysev-1 filter with pass band of 1.5kHz and attenuation constant ε=0.65.The attenuation of this filter at freq 2kHz is _____dB. −11.4dB	1	2	1
5	What is the value of Chebyshev-1 polynomial of degree 0? 1	1	1	2
6	Obtain the digital filter using Bilinear transformation of $H_a(s) = \frac{1}{s^2+5s+6}$ Ha(s) is the transfer function of the analog filter. Assume T=1sec.	1	2	2
7	If the impulse response of the asymmetric linear phase FIR filter of length 7 is h(n)={2 ,-3,4,x, y, z,p},then x=__0__,y=__-4__z=__3__ and p=__-2__	2	1	2
8	In type-I chebyshev filter, the magnitude response is _____ in the passband and _____in the stopband.	1	1	3
9	What is the minimum number of multiplication and additions are required to implement a linear phase FIR filter with h(n)=0 for n<0 and n>63 Mul = 32,63	1	1	3

S.No	Questions (PART-B)	M	BT	CO
1	It is required to design an FIR band pass filter having a duration N=7. $H_d(w)$ represents the ideal characteristics of the non-causal band pass filter with cut off frequency wc1 =1rad and wc2 =2 rad. i) Determine $h_d(n)$ corresponding to $H_d(w)$. ii) Determine filter coefficients using Hamming window.	10	3	3
2	Design a 7 tap linear phase FIR filter using Frequency sampling technique with a cut off frequency of π/2. Also draw the magnitude and phase response.	10	2	4
3	Determine the impulse response of a FIR filter with refection co-efficient k1=0.6, k2=0.3, k3=0.5, k4= 0.9.Also the direct form-1 structure. Calculate the number of	10	3	2

$a_4(3) = 1.33$

$a_4(2) = 1.31$

$a_4(1) = 1.88$

$\frac{1}{\sqrt{1+\varepsilon^2\left(\frac{\Omega}{\Omega_p}\right)^{2N}}}$

D = 4
A = 4
M = 5

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	hard wares used.			
4a	Design & realize a digital low-pass butter worth filter using the bilinear transformation method to satisfy the following characteristics a. monotonic stop band & pass band b. -3.01 dB at cutoff frequency of 0.5π radians. c. magnitude down at least 15dB at 0.0075π radians. And realize the filter using Direct form-II structure.	7	4	3
b	Mention the differences between IIR and FIR filters	3	2	1
5a	Design a digital high pass filter using Cheyshev that will meet the following specifications: Maximum pass band attenuation =2dB Minimum stopband attenuation =20dB Passand edge frequency=190rad/s Stopband edge frequency=100rad/s Sampling rate is 1KHz Use bilinear transformation.	10	3	4

$\omega = \frac{1}{s} T = \frac{2\pi f}{fs}$

$\omega = \Omega / f_s$ Prica

BT-Blooms Taxonomy, CO-Course Outcomes, M-Marks

Marks Distribution	Particulars		CO1	CO2	CO3	CO4	L1	L2	L3	L4	L5	L6
	Test	Max Marks	5	15	19	21	5	18	30	7	-	-

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$\Omega_p = \frac{2}{T} \tan(\omega/2)$

$\Omega_s =$