C **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 95B04

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2023

Fifth Semester

Biomedical Engineering

19UBM504 - PRINCIPLES OF DIGITAL SIGNAL PROCESSING

(Regulation 2019)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10x 2 = 20 Marks)

1.	How many stages of decimations are required in the case of a 64 point	CO1- App
2.	Write the differences and similarities between DIT and DIF?	CO1- U
3.	What is the advantage of direct form II realization when compared to direct form I realization?	CO2- U
4.	Compare IIR and FIR filters	CO2- U
5.	Define Gibbs Phenomenon.	CO3- U
6.	List different methods of realization of LTI system	CO3- U
7.	Define finite word length effects	CO5- U
8.	Give the formula for variance of noise source due to rounding off	CO5- U
9.	Compare Von Neumann and Harvard architecture in DSP	CO6- U
10.	What is MFLOPS	CO6- U

PART – C (5 x 16= 80 Marks)

11.	(a)	Evaluate radix 2 – DIT FFT algorithm and obtain DFT of the sequence x(n) = {1,2,3,4,4,3,2,1}.	CO1- App	(16)
		Or		
	(b)	Derive radix- 2 to DIF-FFT algorithm and Draw the butterfly diagram of each stage considering N=8	CO1- U	(16)

12. (a) (i) Design a low pass analog butterworth filter satisfying the following specifications $\alpha_p = 0.1\ dB\ \alpha_s = 44\ dB \omega_p = 20\ rad/\sec$ and $\omega_s = 30\ rad/sec\ and\ \omega_{sf} = 100\ rad/sec$ CO2- App (8)

(ii) Realize the given LTI system using Form II method $y(n) = x(n) + 2x(n-1) + y(n-1)$ CO3- App (8)

Or

(b) (i) Given the specifications$\alpha_p = 3\ dB\ \alpha_s = 16\ dB$ f_1=1KHzand f_2=2KHz Determine the order of the filter using Chebyshev approximation find H(s) CO2- App (8)

(ii) Realize the given LTI system using parallel form $H(z) = \frac{1+z^{-1}}{1+\frac{1}{8}z^{-1})(1+\frac{1}{2}z^{-1})}$ CO3- App (8)

13. (a) Design an ideal high pass filter with a frequency response CO4- Ana (16)

$H_d(e^{j\omega})$= 1 for $\frac{\pi}{4} \leq |\omega| \leq \pi$

$= 0$ for $|\omega| \leq \frac{\pi}{4}$

Find the values of h(n) for N = 11 using hamming window. Find H(z) and determine the magnitude response.

Or

(b) Determine the filter coefficients $h_d(n)$ obtained by sampling CO4- Ana (16)

$H_d(e^{j\omega}) = e^{-j(N-1)\omega/2} for \quad 0 \leq |\omega| \leq \frac{\pi}{2}$ for N=7

$= 0\ for \quad \frac{\pi}{2} \leq |\omega| \leq \pi$

14. (a) (i) Discuss the different types of errors occurs due to truncation and rounding-off CO5- U (8)

(ii) Draw the product quantization noise model of the system given below$y(n) + 0.2y(n-1) + 0.5y(n-2) = x(n) + 2x(n-1)$ CO5- App (8)

Or

(b) (i) With example discuss different types of number representation in Binary format — CO5- U — (8)

(ii) For second order IIR filter H(z)= $\frac{1}{(1-0.5z^{-1})(1-0.45z^{-1})}$, study the effect of the shift in pole location with 3 bit coefficient representation in direct form and also comment on stability — CO5- App — (8)

15. (a) With neat diagram explain the functional blocks of TMS320C50 DSP — CO6- U — (16)

Or

(b) Discuss in detail the history of TMS processors and their applications — CO6- U — (16)