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

Question Paper Code: 55B04

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

Fifth Semester

Biomedical Engineering

15UBM504 - PRINCIPLES OF DIGITAL SIGNAL PROCESSING

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. Radix – 2 FFT algorithm performs the computation of DFT in CO1- R

   (a) N/2Log2N multiplications and 2Log2 N additions

   (b) N/2Log2NmultiplicationsandNLog2Nadditions

   (c) Log2N multiplications and N/2 Log2N additions

   (d) N Log2N multiplications and N/2 Log2N additions

2. The poles of the Chebyshev filter lie on a CO2- R

   (a) Circle (b) Ellipse (c) Parabola (d) Hyperbola

3. In FIR filter design, which among the following parameters is/are separately controlled by using Kaiser window? CO3- R

   (a) Order of filter (M) (b) Transition width of main lobe

   (c) Both a and b (d) None of the above

4. The error in the filter output that results from rounding or truncating calculations within the filter is called CO4- R

   (a) Coefficient quantization error (b) Adder overflow limit cycle

   (c) Round off noise (d) Limit cycles

5. Decomposing image into band limit components is called CO5- R

   (a) Low coding (b) High coding (c) Intense coding (d)Sub band coding

PART – B (5 x 3= 15Marks)

6. Compute the DFT of the sequence, x(n) = {0,1,2,1}. CO1-U

7. By impulse invariant method obtain the digital filter transfer function of analog filter Take T=1 sec $H(s) = \frac{2}{(S^2+3S+2)}$ CO2-App

8. Write the expression for Hanning, Hamming and Kaiser Window. CO3-U

9. The filter coefficient H=-0.673 is represented by sign magnitude fixed point arithmetic. If the word length is 6 bits, compute the quantization error due to truncation. CO4-App

10. What are the characteristics of wavelet transform. CO5-U

PART – C (5 x 16= 80Marks)

11. (a) Determine the response of the sample data sequence x(n)={1,-1,-1,-1,1,1,1,-1} by radix 2 DIT FFT algorithm. CO1- App (16)

Or

(b) Discuss about circular convolution and circular correlation property CO1- App (16)

12. (a) Design Butterworth filter using bilinear transformation method for the following specifications CO2- App (16)

$0.707 \le |H(e^{j\omega})| \ge 1.0 \qquad 0 \le \omega \le 0.2\pi$

$|H(e^{j\omega})| \ge 0.08 \qquad 0.4\pi \le \omega \le \pi$

Or

(b) For the given specification, design a Butterworth high pass filter α_p=3db, α_s=15db, Ω_p=1000 rad/sec and Ω_s=500 rad/sec. Convert the analog transfer function to digital using bilinear transformation. CO2- App (16)

13. (a) Design a FIR filter using hanning window for the specification given CO3- App (16)

$$H_d e^{(jw)} = \begin{cases} 1 & for -\pi/4 \le w \le \pi \\ 0 & for\ w \le \pi/4 \end{cases}$$

Or

(b) Design a linear phase FIR high pass filter using hamming window with a cutoff frequency 0.8π rad/sec using hamming window. Take N=7 CO3- App (16)

14.	(a)	Discuss the coefficient quantization in IIR filter and FIR filter	CO4-U	(16)
		Or		
	(b)	Discuss the effects of finite word length in FIR digital filters	CO4- U	(16)
15.	(a)	Elaborate the Pyramid Algorithm in wavelets.	CO5- U	(16)
		Or		
	(b)	Explain in detail about different types of non-parametric estimation of power spectrum density.	CO5- U	(16)