

GANPAT UNIVERSITY
B. TECH. SEMESTER V BIOMEDICAL & INSTRUMENTATION ENGINEERING
REGULAR EXAMINATION NOVEMBER/DECEMBER- 2014
2BM504:- BIOLOGICAL DIGITAL SIGNAL PROCESSING

Time: 3 Hours

Total Marks: 70

Instruction:

1. All the questions are compulsory.
2. Answer of each section must be written in separate answer books.
3. Figure to the right indicates marks.
4. Assume data, if needed.

SECTION - I

Que.-1 12

- (a) Compute the 8-point DFT of the discrete sequence using matrix method $X(n) = (1,0,1,-1,1,-1,0,1)$
- (b) Write down the trigonometric form of Fourier series and derive the equation for coefficient a_n .

OR

Que.-1 12

- (a) State the necessary and sufficient condition for the existence of the Fourier series. Explain the odd and even function.
- (b) What are the twiddle factors? Derive the value of twiddle factor for 4 & 8 point DFT.

Que.-2 11

- (a) What is the need for FFT algorithm to calculate DFT values? Explain the radix-2 FFT algorithm.
- (b) Why the result of circular & Linear convolution is not same? Also explain how to obtain the same result from linear & circular convolution.

OR

Que.-2 11

- (a) What is butter fly diagram? Derive the 4-point DFT using butter fly diagram of the sequence
 $X(n) = (0,0,-1,1)$ & $X(n) = (-1,-1,2,1)$
- (b) Enlist the various structures to realize the IIR system Derive the system transfer function of IIR filter. Explain the direct form-I realization of FIR system and draw its structure.

Que.-3 Answer the following questions (Any Three) 12

- (a) Give the various windowing techniques for FIR filter design. Explain any one of them in detail.
- (b) "Twiddle factor is periodic or cyclic:" prove this statement.
- (c) Derive the IDFT of the input sequences $X(k) = (3,2+j,-2,2-2j)$.
- (d) List the types of digital filters. Give all the advantages and disadvantages of digital filters.

SECTION - II

Que.-4

12

- (a) Define System. Give the Classification of system and explain with examples.
- (b) What are the advantages of Z-transform? Determine the Z-transform and sketch the ROC of

$$x(n) = \begin{cases} (1/3)^n & , \quad n > 0, \\ (1/2)^n & , \quad n < 0, \end{cases}$$

OR

Que.-4

12

- (a) What is Data compression? Describe various data compression methods.
- (b) The analog signal given below is sampled by 600 samples per second. $X(t) = 2 \sin 480 \pi t + 3 \sin 720 \pi t$
Calculate:
1) Nyquist sampling rate 2) Maximum frequency
3) What are frequencies in radians in the resulting discrete signal $x[n]$

Que.-5

11

- (a) Discuss the differences and similarities between Microprocessor and DSP processor
- (b) What is finite precision effect? How to represent the number using IEEE format.

OR

Que.-5

11

- (a) Draw the block diagram for biomedical signal processing and discuss each block.
- (b) Discuss various application of adaptive filter in biomedical field.

Que.-6 Answer the following questions (Any three)

12

- (a) Explain Least-Mean-Square (LMS) Algorithm.
- (b) Determine the IZT of $X(z) = 1 / (1 - az^{-1})$.
- (c) What is sampling and aliasing? Discuss sampling theorem.
- (d) Determine whether the following systems are causal, static and time variant:
1. $Y(n) = x(n) + nx(n+1)$
 2. $Y(n) = x^2(n)$
 3. $Y(n) = x(-n)$
 4. $Y(n) = e^{x(n)}$

-----END OF PAPER-----