

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 |
| | <ol style="list-style-type: none"> (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 |
| | <ol style="list-style-type: none"> (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 |
| | <ol style="list-style-type: none"> (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 |
| | <ol style="list-style-type: none"> (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 |
| | <ol style="list-style-type: none"> (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-----