

**GANPAT UNIVERSITY****B. Tech. Semester: V (Biomedical & Instrumentation Engineering)****Regular Examination Nov. – Dec. 2015****2BM504: BIOLOGICAL DIGITAL SIGNAL PROCESSING****Total Marks: 70****Time: 3 Hours**

- 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.
  5. Conventional terms / notations are used.

**Section - I****Que. -1**

- (a) Write the formula of trigonometric Fourier Series of a periodic signal. Derive the expression for coefficient of Fourier Series  $a_n$ . 12
- (b) What is DFT? Compute the 4 point DFT of sequence using conventional DFT equation method for sequence  $x(n)=(0,1,-1,1)$  6

**OR****Que. -1**

- (a) Derive the circular (periodic) convolution response using graphical method for the sequences  $x(n)=(2,1,0,1,2)$  &  $h(n)=(5,3,2,1)$  12
- (b) What are the twiddle factors? Derive the value of twiddle factor for 4 & 8 point DFT. 6

**Que. -2**

- (a) How many complex computations are involved in an N-point DFT? Using DIT Radix-2 FFT algorithm derive the first stage of decimation equation. 11
- (b) Find out digital transfer function  $H(Z)$  using impulse invariance method at 5 Hz sampling frequency from  $H(s)$  as given,  $H(s) = \frac{2}{(s+1)(s+2)}$  6

**OR****Que. -2**

- (a) What is filter? Derive the Transfer Function of FIR digital filter and design the direct form realization of FIR system. 11
- (b) What is butterfly diagram for FFT? Draw the butterfly diagram using DIT Radix-2 algorithm and derive 8-point DFT values for given sequence  $X(n)=(1,1,1,1,1,1,1,1)$ . 5

**Que. -3**

- (a) Why the result of circular & linear convolution is not same? Also explain how to obtain the same result from linear & circular convolution. 12
- (b) Give the advantages and disadvantages of digital filters. 4
- (c) Using butterfly diagram derive the IDFT of the input sequences given as  $X(k) = (3,2+j,-2,2-2j)$ . 4



**Section – II**

- Que.- 4** 12
- (a) Enumerate various properties of z transform. State and prove the linearity property. Also give the comment on ROC for the same. 6
- (b) Draw & explain the block diagram of biomedical digital signal processing with example. 6

OR

- Que.- 4** 12
- (a) Determine IZT for  $X[z] = Z / 3Z^2 - 4Z + 1$  using Partial fraction expansion method. 6
- (b) Find the following systems are linear or nonlinear. 6
1.  $Y[n] = m X[n] + C$
  2.  $Y[n] = X [n^2]$
  3.  $Y[n] = X[-n+2]$

- Que.- 5** 11
- (a) Discuss Run Length Encoding and Huffman Coding techniques for data compression giving example. 6
- (b) Describe Harvard architecture. What is the main difference between Harvard and von Neumann model? 5

OR

- Que.- 5** 11
- (a) Discuss various applications of adaptive filter. 6
- (b) How to represent the number using IEEE format? Represent  $[0.5]_{10}$  in single precision format. 5
- Que.- 6** 12
- (a) What are the advantages of Digital signal processing over Analog signal processing? 6
- (b) Classify various signals giving example. 6

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