R18

Code No: 156AR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, August/September - 2021

DIGITAL SIGNAL PROCESSING

(Common to ECE, EIE)

Time: 3 Hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

1.a) Calculate the total response of the system described by $y(n)-4y(n-1)-12y(n-2)=x(n)$, $y(-1)=1$, $y(-2)=2$.

b) Calculate the transfer function of the system defined by $y(n)-2y(n-1)=x(n)$. [10+5]

2.a) Describe with mathematical equations, how sampling rate can be decreased by a factor of D.

b) Briefly introduce the concepts of Multirate Digital Signal Processing. [10+5]

3.a) Derive the following properties of DFS.
i) Time shifting
ii) Time reversal
iii) Convolution.

b) Draw the butterfly diagram for DITFFT algorithm. [10+5]

4. Calculate the 8 point DFT of the sequence $x(n)=\{1,-2,3,1,-1,2\}$ using DIF-FFT and DIT-FFT. [15]

5.a) Write the differences between bilinear transform and impulse invariant method.

b) Write the differences between analog and digital filters. [8+7]

6. Design butterworth high pass filter for the given specifications:
$\alpha_p=3dB$, $\alpha_s=15dB$, $\Omega_p=1000\,rad/\sec$, $\Omega_s=500\,rad/\sec$. [15]

7. Given the filter specifications as

$$H_d(e^{i\omega})=e^{-j2\omega} \quad for\ 0\le|\omega|\le\frac{\pi}{2}$$

$$=0 \qquad \frac{\pi}{2}\le|\omega|\le\pi$$

using rectangular window, calculate causal impulse response coefficients. [15]

8.a) Realize the following system equation in direct form-I and direct -form II

$$y(n)+3/4y(n-1)=x(n)-2x(n-1)$$

b) Write the differences between direct form-I and canonical form. [10+5]

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