SV - 454

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T.E. (ETC) (Semester - VI) (Revised) Examination, May - 2018

DIGITAL SIGNAL PROCESSING

Sub. Code : 66916

Day and Date : Thursday, 03 - 05 - 2018 **Total Marks : 100**

Time : 02.30 p.m. to 05.30 p.m.

Instructions : 1) **All questions are compulsory.**

2) **Figures to the right indicate full marks.**

Q1) Solve any three. **[18]**

a) What is FFT? Why FFT is needed? How can we calculate IDFT using FFT algorithm.

b) Find the circular convolution of the sequence x(n) [1,3,5,3], h(n)=[2,3,1,1].

c) Find the DFT of the given sequence x(n) = {1,–1,–1,–1,1,1,1,–1} using DIT FFT algorithm.

d) An FIR digital filter has the input impulse response sequence h(n)={2,2,1}. Determine the output sequence in response to the output sequence in response to the input sequence x(n) = {3,0,–2,0,2,1,0,–2,–1,0} using overlap add method.

Q2) Solve any two. **[16]**

a) Explain Gibb's Phenomenon.

b) Find Fourier transform of $x(n) = n \quad -3 \leq n \leq 3$

$= 0 \quad$ Otherwise

c) Find inverse Fourier transform of

i) $X(e^{j\omega}) = 1 + 2e^{-j\omega} + 2e^{-j2\omega} + 3e^{-j3\omega}$

ii) $X(e^{j\omega}) = e^{-j\omega}$ for $-\pi \leq \omega \leq \pi$

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Q3) Solve any two : **[16]**

a) Design a linear phase FIR low pass filter of order seven with cut-off frequency 1 rad/sec. Use rectangular window.

b) Design a filter with

$$H_d\left(e^{j\omega}\right)=e^{-j3\omega} \qquad \frac{-\pi}{4}\le\omega\le\frac{\pi}{4}$$

$$=0 \qquad \frac{\pi}{4}\le\omega\le\pi$$

Using Hanning Window for N = 7.

c) Explain windowing method of filter design.

Q4) Solve any three : **[18]**

a) What is bilinear transformation? Explain frequency warping and prewarping procedure in BLT.

b) Analog filter has a transfer function $(s)=\frac{10}{s^2+7s+10}$. Design a digital filter equivalent to this using impulse invariant method for T= 1 sec.

c) Design a single pole low pass digital filter with a 3-dB bandwidth of 0.2π by use of bilinear transformation applied to the analog filter $H(s)=\frac{\Omega c}{s+\Omega c}$ where Ω_c is 3-dB bandwidth.

d) Design the second order high-pass digital Butterworth filter whose cut-off frequency is 1KHz at sampling frequency of 10^4 sample/sec. Use BLT method.

Q5) Solve any two : **[16]**

a) Realize the system with system function $H(z)=\frac{1+2z^{-1}+z^{-2}}{1-\frac{3}{4}z^{-1}+\frac{1}{8}z^{-2}}$ in cascade form.

b) Obtain parallel form realization of a system with transfer function

$H(z) = 1 + 4z^{-1} - 3z^{-2} + 6z^{-3} - 9z^{-4} + 5z^{-5} + 7z^{-6}$

c) Explain methods of FIR filter realization.

Q6) Solve any two : **[16]**

a) Explain general DSP processor with block diagram.

b) Compare microprocessor and DSP processor.

c) Explain TMS320C67XX.