Hall Ticket Number:

Code No. : 32312

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (E.C.E.) III Year II-Semester Main Examinations, May-2017

Digital Signal Processing

Time: **3** hours Max. Marks: **70**

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***

Part-A (10 ×2 = 20 Marks)

1. The 5 samples of the 8-point DFT X(k) are given as follows X(0) = 0.25; X(1) = 0.125-j0.3018; X(4) = X(6) = 0 and X(5) = 0.125-j0.0518. Determine the remaining samples if the sequence x(n) is real valued sequence.
2. A discrete system is given by the following difference equation: y(n) = x(n) + 4x(n-1). Determine whether the system is time variant or time invariant.
3. Define group delay and phase delay for an FIR filter.
4. Write the properties of Hamming window.
5. Explain the warping effect that occurs in IIR filters
6. Express the order of the Chebyshev filter with detailed information.
7. Consider a signal x(n) = u(n). Obtain a signal with a decimation factor '3'.
8. Derive the spectrum of Up-Sampler used for Multirate Signal Processing.
9. Distinguish between CISC & RISC processors.
10. What are the advantages of DSP processors over conventional microprocessors?

Part-B (5 × 10 = 50 Marks)

11. a) An 8 point sequence is given by x (n) = {2, 2, 2, 2, 1, 1, 1, 1}. Compute 8 point DFT of x (n) using radix - 2 DIF-FFT Algorithm. [7]

    b) Derive the relation between DFT and Z-Transform. [3]

12. a) Design a linear phase FIR Low Pass Filter with the following desired frequency response. [6]

$$H_d(e^{i\omega}) = e^{-j2\omega}, for\ -\pi/4 \le \omega \le \pi/4$$

$$H_d(e^{i\omega}) = 0,\ for -\pi/4 \le |\omega| \le \pi$$

    Determine the filter coefficients $h_d(n)$ if the window function is defined as

$$w(n) = 1 \quad 0 \le n \le 4$$

$$= 0 \quad \text{elsewhere}$$

    Also, determine the frequency response $H(e^{j\omega})$ of the designed filter.

    b) Compare FIR and IIR filters. [4]

13. a) Design a Butter worth IIR low pass filter with pass band edge at 1000 Hz and stop band edge at 1500 Hz for a sampling frequency of 5000 Hz. The filter is to have a pass band ripple of 0.5dB and stop band ripple below 30dB using Impulse Invariant Method. [7]

    b) Realize the given difference equation using cascade form y(n) = -0.1 y(n-1) + 0.2 y(n-2) + 3 x(n) + 3.6 x(n-1) + 0.6 x(n-2). [3]

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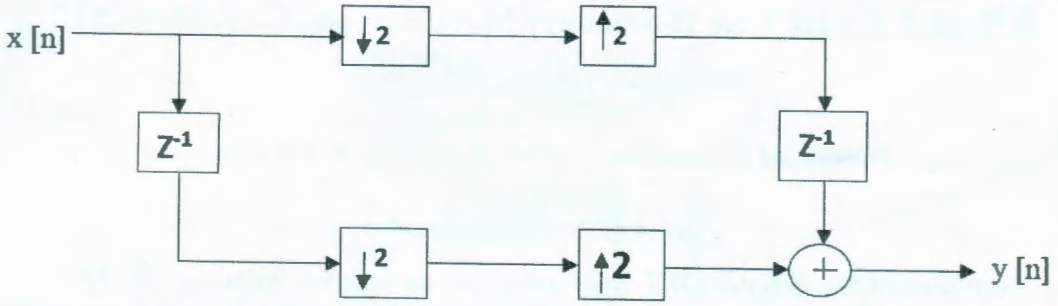
14. a) Consider a multi rate system shown in figure. Determine y[n] in terms of x[n]. [5]



b) Describe the decimation process with a factor of 'M '. Obtain necessary expression. [5]

15. a) Explain about instruction set that supports TMS 320C54XX processor. [6]

b) Describe why CISC processors are being used in DSP applications. [4]

16. a) In an LTI system the input x[n] = {1, 1, 1} and the impulse response h[n] = {-1, -1} Determine the response of LTI system by radix 2 DIT- FFT algorithm. [7]

b) Explain in brief, about the limit cycles that occur in the design of digital filters. [3]

17. Answer any ***two*** of the following:

a) Differences between Butterworth and Chebyshev filter approximations. [5]

b) Applications of Multi rate Digital Signal Processing. [5]

c) Barrel Shifter used in TMS 320C54XX architecture. [5]