19/04/2017 Question Paper



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MANIPAL UNIVERSITY

SCHOOL OF INFORMATION SCIENCES (SOIS) SECOND SEMESTER MASTER OF ENGINEERING - ME (EMBEDDED SYSTEMS / FOURTH SEMESTER MSc Tech(VLSI **DESIGN / EMBEDDED SYSTEMS)**

> **DEGREE EXAMINATION - APRIL / MAY 2017** Wednesday, 19, 2017 Time: 10:00 AM - 1:00 PM

Digital Signal Processing [ESD 602]

Marks: 100 Duration: 180 mins.

A

Answer all the questions.

1) (10)Find the DFT of x(n) = [1, 2, 3, 4, 4, 3, 2, 1] using DIF-FFT algorithm

Realize the following system function using Direct form-I, Direct form-II (10)2) and Cascade / Parallel forms

 $H(z) = [2(1-z^{-1})(1+1.414z^{-1}+z^{-2})/[(1+0.5z^{-1})(1-0.9z^{-1}+0.81z^{-2})]$

- (10)3) Design a linear phase bandpass FIR filter having cut-off frequencies of 1 KHz and 3 KHz using Frequency Sampling Technique. The system employs a sampling frequency of 8 KHz. Assume 10 tap coefficients.
- 4) (10)Design an FIR linear phase lowpass filter using windows to meet the following specifications.

 $0.99 < |H(e^{jW})| \le 1.01;$

for $0 \le |w| \le 0.19 \pi \text{ rads}$

 $|H(e^{jW})| \le 0.01$; for $0.21\pi \le |w| \le \pi$ rads

5) (20)Design using impulse invariance technique, a digital Butterworth lowpass filter for the following specifications.

 $|H(i\Omega)| \geq -1 dB$

 $0 \le \Omega \le 100 \text{ rad/sec}$

 $|H(i\Omega)| \leq -40 \text{ dB}$

 $\Omega \geq 2000 \text{ rad/sec.}$

Sampling frequency = 8000 rad/sec. Realize the filter structure.

(10)6) Provide polyphase filter structures of interpolator and decimator. Explain how these structures are in a position to provide the required sampling rate conversion

(10)

7)

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Explain how multirate signal processing can be used in the analysis and synthesis of sub-band coding of speech signals.

- Explain analytically, how optimum filter coefficients are obtained on Mean Square Error sense in Wiener Filter Configuration.
- Draw the architecture of a TMS320C6X DSP processor and give the functionality of each of the block.

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