

Code No: 56027

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

B. Tech III Year II Semester Examinations, November/December - 2015

DIGITAL SIGNAL PROCESSING

(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- 1.a) Determine whether the following systems are linear, time-invariant
i) $y(n) = n x^2(n)$ ii) $y(n) = a x(n)$.
- b) Find the impulse response for the system given by the following equation
 $y(n) + 3y(n-1) + 2y(n-2) = 2x(n) - x(n-1)$. [8+7]
- 2.a) Find the output sequence $y(n)$ if $h(n) = (1, 1, 1)$ and $x(n) = (1, 2, 3, 1)$ using a circular convolution.
- b) State and prove the properties of Fourier transform. [8+7]
- 3.a) Prove that FFT algorithms help in reducing the number of computations involved in DFT computation.
- b) Compute the FFT for the sequence $x(n) = n+1$ where $n = 8$ using DIT algorithm. [7+8]
4. Obtain the a) Direct forms b) cascade c) parallel form realizations for the system
 $y(n) = \frac{3}{4}x(n-1) - \frac{1}{8}y(n-2) + x(n) + \frac{1}{3}x(n-1)$ [15]
5. Design a digital Butterworth filter satisfying the constraints
 $0.707 \leq H(e^{j\omega}) \leq 1$ for $0 \leq \omega \leq \pi/2$
 $H(e^{j\omega}) \leq 0.2$ for $3\pi/4 \leq \omega \leq \pi$
With $T = 1$ sec using Bilinear transformation. [15]
- 6.a) Discuss the characteristics of FIR filters.
- b) Compare IIR and FIR digital filters. [8+7]
- 7.a) Explain with the block diagram, the general poly phase framework for interpolator and decimator.
- b) Explain about different applications of Multirate digital signal processing. [8+7]
- 8.a) Consider a second order IIR filter with $H(Z) = \frac{1.0}{(1-0.5z^{-1})(1-0.4z^{-1})}$. Find the effect on quantization on pole locations of the given system function in direct form and in cascade form. Assume $b = 3$ bits.
- b) With respect to finite word length effects in digital filters, with examples discuss about Over flow limit cycle oscillation. [8+7]

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