

Code No: 56027

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

B. Tech III Year II Semester Examinations, December-2014/January-2015

DIGITAL SIGNAL PROCESSING

(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal mark

- 1.a) Determine the response $y(n)$ for $n \geq 0$ of the system described by the difference equation.
 $y(n)-3y(n-1)-4y(n-2) = x(n)+2x(n-1)$ for the input sequence $x(n) = 4^n u(n)$.
- b) Explain the classification of discrete time systems each with an example.
- 2.a) State and prove the any four properties of discrete fourier series.
- b) Perform the linear convolution of the DT sequences $x(n)=\{1, 1\}$ and $h(n)=\{1, 2\}$ using DFT and IDFT method.
- c) Explain the relationship between DTFT and Z-transform.
- 3.a) Compute the IDFT of the sequence $X(K) = \{20, -5.828- j2.414, 0, 0.172- j0.414, 0, -0.172+ j0.414, 0, -5.828+ j2.414\}$ using Radix-2-DIT-FFT algorithm.
- b) Explain the following:
 - i) Symmetry and periodicity property of twiddle factor (phase factor).
 - ii) In-place computation.
 - iii) Bit- Reversal order.
- 4.a) Obtain the direct form-I, direct form-II, cascade and parallel form realization of the system function given by $H(z) = (1+1/4 z^{-1}) / (1+1/2 z^{-1})(1+1/2 z^{-1}+1/4 z^{-2})$.
- b) Explain any four applications of Z-transforms with an example.
- 5.a) Compare the performance characteristics of butterworth and chebyshev filters with transfer characteristics.
- b) Use the bilinear transformation technique to convert the analog filter with system function $H(s) = [s+0.1] / [(s+0.1)^2 + 9]$ into a digital IIR filter for $T = 0.1$ sec.
- 6.a) The desired frequency response of a low-pass filter is;

$$H_d(e^{j\omega}) = \begin{cases} e^{-j3\omega} & -3\pi/4 \leq \omega \leq 3\pi/4 \\ 0 & 3\pi/4 \leq \omega \leq \pi \end{cases}$$
 Determine $H(e^{j\omega})$ for $N = 7$ using rectangular window.
- b) Compare FIR and IIR filters.
- 7.a) Define down-sampling, up-sampling and its significance.
- b) Explain the sampling rate conversion by a factor of I/D, with the help of block diagram.
- 8.a) Explain the Round-off noise in IIR digital filters.
- b) Explain about dead band effects.