Code :R7311902 **R7**

III B.Tech I Semester(R07) Supplementary Examinations, May 2011
DIGITAL SIGNAL PROCESSING
(Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE questions
All questions carry equal marks

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1. (a) Verify whether the following sequence is periodic or not, if periodic find the fundamental period.
   i. $X(n) = e^{j(n/4-\pi)}$
   ii. $X(n) = \sin(\pi n^2/4)$
   (b) Determine the impulse response and unit step response of the systems described by the following differential equations.
   Y(n)=0.4(n-1)-0.06y(n-2)+x(n)
   Y(n)=0.05y(n-1)-0.1y(n-2)+4x(n)-x(n-2)
2. Consider two periodic sequences x(n) and y(n), x(n) has period N and y(n) has period M. The sequence W(n) is defined as W(n)=x(n)+y(n).
   (a) Show that W (n) is periodic with period MN
   (b) Determine W(k) in terms of x(k) and y(k) whre x(k), y(k) and W(k) are discrete fourier series coeffients with periods of N, M and MN respectively.
3. (a) Draw and explain the butterfly line diagram for 8-point FFT calculation using decimation in time algorithm.
   (b) Computer the FFT for the sequence {1,0,0,0,0,0,0,0}
4. (a) Explain how the analysis of discrete time invariant system can be obtained using convolution properties of Z transform.
   (b) Define stable and unstable system, test the condition for stability of the first order IIR filter governed by the equation y(n)=x(n)+bx(n-1).
5. Determine the system function H(z) of the lowest order Chebyshev and Butterworth digital filter with the following specifications.
   (a) 3dB riple in pass band $0 \leq \omega \leq 0.2\pi$
   (b) At least 40dB attenuation in the stop band $0.35\pi \leq /\omega/ \leq \pi$
6. (a) Design a low pass filter using fourier series method using rectangular windows for 5 taps only, if the folding frequency is 5 KHz and the corner frequencies are 1 KHz and 3 KHz.
   (b) Tabulate the comparison between IIR and FIR filters with respect to various features.
7. (a) Explain the concept of decimation and interpolation used in DSP with suitable examples.
   (b) Determine the decimation process with a factor of M. Obtain necessary expression.
8. Describe the concept of pipelining. Explain the instruction cycles of a processor with and without pipelining. Draw the relevant diagrams.

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