Digital Signal Processing
(EC-308, Dec-2005)

Note: Section A is compulsory. Attempt any four questions from Section-B and any two from Section-C.

Section-A

1. a) What are the advantages of DSP over analog processing?
   b) State sampling theorem.
   c) Convolve [1, 3, 1] and [1, 2, 2]
   d) Define LTI system.
   e) Differentiate between linear-nonlinear systems.
   f) What is the difference between stable-astable systems?
   g) What is FIR?
   h) Define DFT.
   i) What is Region of convergence?
   j) State convolution theorem.

Section-B

2. Perform circular convolution of two sequences.
   x_1 (n) = {0.2, 0.4, 0.6, 0.8, 1, 1.2, 1.4, 1.6}
   x_2 (n) = {0.1, 0.3, 0.5, 0.7, 0.9, 1.1, 1, 3, 1}
3. Find z transforms of $\left\{\cos\left\{\frac{n\pi}{4}+\alpha\right\}\right\}_{n\geq 0}$
4. Find the inverse z transform of X(z) = $\frac{1+2z-1+z-2}{1-z-1+0.356z-2}$
5. Represent system function using linear phase FIR structure
   H(z) = $\frac{z}{2}+1+\frac{z-1}{2}$
6. What are the various realization techniques of linear time invariant systems? Mention.

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Section-C

7. For a given analog filter system function H(S) = $\frac{S+0.1}{(S+0.1)2+16}$ into digital IPR filter by means of Bilencar Z transformation. Digital filter is to have resonant frequency w_r = $\frac{\pi}{2}$
8. (a) Compare different forms/structures of filter realization from the point of view of speed and memory requirement.
   (b) Explain with neat sketches, the cascade and parallel realization forms of digital filters.
9. (a) List various properties of z transforms.
   (b) What is decimation in frequency method for computing DFT? What are advantages of radix 2 FFT?