Sem VI - EXTC - CBSGS - DTSP - Dec'17 27/11/17

Q.P.Code:16205

(3 hours) **[Total Marks: 80]**

N.B: 1) Question number **1 is compulsory**
2) Solve any **three** questions out of the remaining **five** questions
3) In all four questions to be attempted.
4) **Figures** to the **right** indicate full marks

Q.1(a) A digital filter has following transfer function. Identify the type of filter and justify it (05)

$$H(z) = \frac{1}{1+0.9z^{-1}}$$

(b) Compare FIR and IIR filter. (05)

(c) What is multirate signal processing? Discuss important applications of multirate signal Processing. (05)

(d) $x(n) = 4\partial(n) + 3\partial(n-1) + 2\partial(n-2) + \partial(n-3)$ is a six-point sequence. (05)

(i) Find p (n) if $P(k) = W_N{}^{2k}\, X(K)$ (ii) If $Q(K) = X(K-3)$, $find\ q(n)$.

Q2) (a) Compute DFT of a sequence x(n) = {1, 2, 2 ,3 ,1, 2, 2,3} using **DIF-FFT** algorithm. Compare computational complexity of DIFFFT with DFT for the given signal. (10)

(b) Design FIR filter using frequency sampling technique for the following specifications. (10)

$H_d(e^{j\omega}) = e^{-j3\omega}$ $\omega \le \frac{\pi}{2}$

$H_d(e^{j\omega}) = 0$ elsewhere

Q3 (a) Derive composite radix DITFFT flow graph for N= 6 = 3 ×2 (10)

(b) Design a digital Butterworth Low pass IIR filter using Impulse invariant technique by (10)

taking T =1sec to Satisfy following specifications

$0.707 \le |H(e^{j\omega})| \le 1.0$ $0 \le \omega \le 0.3\pi$

$|H(e^{j\omega})| \le 0.2$ $0.75\pi \le \omega \le \pi$

Q4) (a) The transfer function for discrete time causal system is given by (10)

$$H(z) = \frac{1-z^{-1}}{1-0.2z^{-1}-0.15z^{-1}}$$

i. Draw Direct Form-I and Direct form-II realization structure.
ii. Draw cascade and parallel realization
iii. Find impulse response of the system.

Turn Over

(b) If x(n)= {2,3,4,5}

i. Find DFT of x(n) using DITFFT.

ii. If y(n) = x(n-1). Find DFT of y(n)

iii. m(n) = x(n) +j y(n). Find DFT of m(n) using above results only. (10)

Q (5) (a) x(n)= { 1,2,3,2} and h(n)= { 1,2,3} (10)

i. Find circular convolution between x(n) and y(n) using time domain and frequency domain method.

ii.Find linear convolution between x(n) and h(n).

iii. Compare circular convolution and linear convolution results. Comment on it.

(b) Explain the effect of aliasing in impulse invariant technique (05)

(c) X(K)={26, -2 + 2j, -2 , -2- 2j} find x(n) using IDIFFT algorithm. (05)

Q (6) (a) Explain the process of decimation with frequency spectrum. (5*4 =20)

(b) Explain in detail the effect of finite world length effects in digital filters.

(c) Explain sub band coding of speech signal.

(d) Impulse response of the FIR filter is h(n) = {1,2,3,2,1}, draw linear phase realization structure.