T.E (Instru) Sem-VI CBGS

30/11/18

1/2

[Time: Three Hours] [Marks:80]

Please check whether you have got the right question paper.

N.B:
1. Question 1 is compulsory.
2. Attempt any three questions out of remaining five questions.
3. Assume suitable data if necessary.

Q. 1 Answer the following (Any Four) **(20)**

a) State and prove convolution property of Z transform.

b) Draw and explain block diagram of DSP processor.

c) Convert the analog filter with system function $H(s) = \frac{(s+0.1)}{(s+0.1)^2+16}$ into a digital IIR filter using Bilinear transformation. The resonant frequency $w_r = \frac{\pi}{2}$

d) $h(n) = \{3\ 1\ 2\ 8\}$
$x(n) = \{4\ 9\ 2\}$
Find $y(n)$ using convolution property of z Transform.

e) Draw the pole zero plot and transfer function of following filter.
i) comb filter ii) Notch filter

Q. 2 a) **(10)**

i) $X(n) = \{3 + j6, 1 + j5, (7 + j2), 8 + j9\}$
Find its DFT X [k]

ii) Using result obtained in i) and not otherwise, find the DFT of the following sequences
1) $x(n) = \{3\ 1\ 7\ 8\}$
2) $x_2(n) = \{6\ 5\ 2\ 9\}$

b) Find the circular convolution of the sequences using FFT and IFFT method. **(10)**
$x_1(n) = \{1\ -2\ 3\ 7\}$ $x_2(n) = \{7\ 4\ 5\ 1\}$

Q. 3 a) Obtain DFI, DF II, cascade and parallel realization of system function **(10)**
$H[z] = \frac{1+2z^{-1}+z^{-2}}{1-0.75z^{-1}+0.125z^{-2}}$

b) Determine the output of a Linear filter whose impulse response h(n) is $h(n) = \{2\ 1\ 6\}$ and input $x(n)$ is $x(n) = \{2\ -3\ 1\ 2\ -1\ -2\ 5\ 4\ 1\ -3\ -1\ 2\}$ using overlap save method. **(10)**

Q. 4 a) Find the 8 point DFT using DITFFT algorithm **(10)**
$x(n) = \{3\ 6\ 1\ -2\ 4\ 1\ 5\ 7\}$

b) A low pass filter has the desired response as given below $Hd(ejw) = \begin{cases} e^{-j3w} & 0 \le w \le \pi \\ 0 & \frac{\pi}{2} \le w \le \pi \end{cases}$ **(10)**

Determine the filter coefficients h (n) for M = 7 using type 1 frequency sampling method.

Q. 5 a) A low pass filter has following specifications **(10)**
$0.8 \le |H(ej\omega)| \le 1$ for $0 \le \omega \le 0.2\pi$
$|H(ej\omega)| \le 0.2$ for $0.6\pi \le \omega \le \pi$

Find the filter order and analog cutoff frequency Ω c if
i) Bilinear transformation technique is used for designing.
ii) Impulse Invariance technique is used for designing.

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b) A low pass filter is to be designed with the following desired frequency response (10)

$Hd(e^{j\omega}) = e^{-j3\omega} \quad \frac{-\pi}{4} \leq \omega \leq \frac{\pi}{4}$

$= 0 \quad \frac{\pi}{4} \leq |\omega| \leq \pi$

Determine the filter coefficients, if the window used is hamming window.

Q. 6 a) Develop DITFFT algorithm for decomposing the DFT for N = 6 and draw the flow diagram for N = 2.3. (10)

b) Explain engineering applications of DSP processors. (10)

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