Total No. of Questions : 10]

SEAT No. :

P2871

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[4958]-1060
T.E.(Electronics)
DISCRETE TIME SIGNAL PROCESSING
(2012 Course) (End Sem) (304210)(Semester-II)

Time :2½Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary***
2) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
3) ***Assume suitable data if necessary.***

Q1) a) An analog signal in represented as $x(t) = 5 \cos(2\pi\, 2000t) + \cos(2\pi 5000t)$ **[6]**

i) What is the Nyquist rate for this signal?

ii) If we sample this signal at a rate of 8KHz, what is the folding frequency?

iii) Write the equation for the sampled signal

b) Compute the 4 point DFT of the sequence $x(n) = \{1\ 2\ 3\ 4\}$ using linear transformation method. **[4]**

OR

Q2) a) Compute the linear convolution of following sequences using Z-transform. **[6]**

$x_1(n) = \{1\ 2\ 1\ 1\}$

$x_2(n) = \{2\ 1\ 2\ 1\}$

b) Compute the circular convolution of following sequences. **[4]**

$x_1(n) = \{4\ 3\ 2\ 1\}$

$x_2(n) = \{1\ 2\ 1\ 2\ \}$

Q3) a) Compute the Z-transform of following sequences. **[6]**

i) $x(n) = n\, u(n)$

ii) $x(n) = \left(\frac{1}{2}\right)^n u(n) + (3)^n u(-n-1)$

P.T.O.

b) H(z) is a cascade combination of $H_1(z)$ & $H_2(z)$ where **[4]**

$H_1(z)=\frac{1}{1-0.2z^{-1}}$ $H_2(z)=\frac{1}{1-0.3z^{-1}}$ write the overall system function.

OR

Q4) a) Compute the IDFT of the following sequence x(k)={7 –2–j 1 –2+j} **[4]**

b) If the output of the system is given by y(n) = 1.5 y(n-1) – 0.5y (n–2) + x (n) + 2x(n–1)

Find the system function & inpulse response **[6]**

Q5) a) Show that the sysmetric FIR filter has linear phase response. **[6]**

b) Write a note on window functions **[4]**

c) Design a bandpass FIR using hamming window for M = 11. **[7]**

$H(e^{jw})=1 \quad \pi/4 \le w \le 3\pi/4$

$= 0$ otherwise.

OR

Q6) a) What is Gibb's Phenomenon? How it is reduced? **[6]**

b) Using frequency sampling method, design FIR filter for N=7 **[11]**

$H(e^{jw})=1 \quad 0 \le w \le \pi/2$

$= 0 \quad \pi/2 \le w < \pi$

Q7) a) Realize the following system in direct form I & direct form II **[6]**

y(n) = 0.3 y(n–1)–0.2y(n–2)+x(n)–2x(n–1)+ 0.2x(n–2)

b) What is frequency warping in Bilinear Transformation? How is it overcome? **[5]**

c) Convert the analog filter with system function **[6]**

$H(s)=\frac{s+0.2}{(s+0.2)^2+9}$

into a digital filter by means of impulse Invariant technique. Assume T = 1sec

OR

Q8) a) Design digital butterworth filter that satisfies the following specification using Bilinear Transformation **[12]**

Sampling frequency = 8 KHz

Passband = 0 – 500 Hz

Stopband = 2– 4 KHz

δ_p = 3dB

δ_s = 20dB

Assume 2/T = 1

b) Explain direct form II structure for realization of LTI system **[5]**

Q9) a) With the help of block diagram, explain the sampling rate conversion by a non-integer factor **[8]**

b) Discuss the desirable features of a digital signal processor **[8]**

OR

Q10) a) Explain the polyphase structure used for interpolation. **[7]**

b) Write note on **[9]**

i) MAC unit

ii) Barrel shifter

iii) Pipelining