College Of Engineering, Pune
(An Autonomous Institute of Government of Maharashtra)
Mid Semester Examination

Instru & Control

IE- 303 Digital signal processing
Semester - I

Year: 2012
Academic Year: 2012~2013
Duration: 3 hrs
Branch: Instrumentation and Control
Max. Marks: 50

Instructions:

1. Solve any five questions.
2. Figures to right indicate full marks.
3. Draw neat figures wherever required.
4. Assume suitable data if necessary.
5. Use of non programmable calculator is allowed.

Q.1 a. What do you mean by real number single precision representation 5

b. What are problems in storing and recalling in digital computers? 3

c. What are the functions of shadow registers? 2

Q.2 a. What is multiport memory? How is affect the operations of processor? What are limitations of such technology? 3

b. Explain the working of time division multiplexing 2

c. write the meanings of following instructions 5
i. SACH, ii. SACL, iii. SAMM, vi. LAR, v. SAR

Q.3 a. Determine the output response of a system having impulse response $h(n) = (1/4)^n u(n)$ subjected to the input signal $x(n) = e^{jn(\pi/4)} + 3e^{-jn\pi/3}$ 4

b. A four pole band pass filter system has 6
$|H(\omega)| = 1$ for $\pi/6 <= \omega <= \pi/2$
$= 0$ elsewhere
With four poles at $P_1 = 0.8\, e^{j2\pi/9}$; $P_2 = 0.8\, e^{-j2\pi/9}$; $P_3 = 0.8\, e^{j4\pi/9}$; and $P_4 = 0.8\, e^{-j4\pi/9}$
With four zeros at $Z_1 = 1$; $Z_2 = -1$; $Z_3 = e^{j3\pi/4}$; and $Z_4 = e^{-j3\pi/4}$
Determine the H(z) such that
$|H(5\pi/2)| = 1$

Q.4 a. Find the DFT of the following sequence x by using **DIF FFT** algorithm. 5

$x = (1, -1, -1, -1, 1, 1, 1, -1)$

b. Find the circular convolution of $x = (1\ 0\ 1\ 1\ 0)$, $y = (1\ 2\ 3\ 4\ 5)$ using DFT property 5

Q.5 a. Design an analog Chevbyshev low-pass filter to satisfy the following specifications: (a) acceptable passband ripple of 2 dB, (b) cutoff frequency of 40 rad/sec, and (c) stopband attenuation of 20 dB or more at 50 rad/sec. 5

b. Design a FIR of following specification 5

$H_d(\omega) = 0$ for $0 \leq |\omega| \leq \pi / 2$

$= 1$ for $\pi / 2 \leq |\omega| \leq \pi$

with filter length 11 and hamming window

Q.6 a Design an analog filter with following specifications 5

a. Maximally flat
b. Pass all the signals of radian frequency greater than 20 rad/sec with no more than 2 dB of attenuation
c. Stopband attenuation of greater than 20 dB for all Ω less than 10 rad/sec.

b Design a low pass FIR filter with following specifications 5

Passband frequency = 1kHz (f_p)
Stopband frequency = 4 kHz (f_s)
Sampling frequency = 10 kHz (F_s)
Passband attenuation = 1 dB (A_p)
Stopband attenuation = 15 dB(A_s)
Using Kaiser window