(Following Paper ID and Roll No. to be filled in your Answer Books)

PAPER ID : MC21

Roll No. | | | | | | | | | | |

M. TECH. (Sem.II)

THEORY EXAMINATION 2015-16

DIGITAL SIGNAL PROCESSOR

Time : **3** Hours Total Marks : **100**

Note : Attempt all questions.

1. Attempt all following question. Give answer in brief description. (10×2=20)
   (a) Differentiate between FIR and IIR filters.
   (b) Enlist the advantages of digital signal processing.
   (c) Discuss the D/ A converter.
   (d) Explain the sampling theorem and derive the expression for A/D converter.
   (e) Explain the Gibbs phenomenon in detail.
   (f) Write the applications of FFT algorithm.
   (g) Enlist the properties of linear phase FIR filter.
   (h) Compare the HR and FIR filters.
   (i) Explain the digital signal processor.
   (j) Discuss the stability and causality of the systems.

2. Attempt any TWO of the followings. (10×2=20)

(a) What is the difference between circular convolution and linear convolution? Consider a LTI system with unit sample response

$h(n) = a^n;\ n \geq 0,\ |a| < 1$

$h(n) = 0; n < 0,$

Find the response to an input of x(n)=U(n)-U(n-N)

(b) (i) Check whether the following systems are linear and time invariant :

$$F[x(n)] = a[x(n)]^3 + bx(n)^2$$

(ii) Check the stability of filter for :

$$H(Z) = \frac{Z^2 - Z + 1}{Z^2 - Z + \frac{1}{2}}$$

(c) Explain the cascade and lattice realization of FIR systems with suitable examples.

3. Attempt any TWO of the followings. (10×2=20)

(a) Explain the Radix-2, Radix-4 algorithms with suitable examples.

(b) Explain the optimal FIR filter design procedure.

(c) Obtain the FIR linear phase and cascade realizations of the system function

$$H(z) = \left(1 + \frac{1}{4}z^{-1} + z^{-2}\right)(1 + \frac{1}{8}z^{-1} + z^{-2})$$

4. Attempt any TWO of the followings. (10×2=20)

(a) Develop the cascade and parallel realization structures for

$$H(z) = \frac{\frac{z}{4} + \frac{7}{16} + \frac{7}{16}z^{-1} + \frac{1}{16}z^{-2}}{1 - \frac{1}{3}z^{-1} + \frac{1}{6}z^{-2}}$$

(b) Obtain the cascade and parallel realizations for the system function given by

$$H(z) = \frac{1 + \frac{1}{6}z^{-1}}{\left(1 + \frac{1}{3}z^{-1}\right)(1 + \frac{1}{3}z^{-1} + \frac{1}{6}z^{-2})}$$

(c) Explain the IIR filter design by bilinear transformation technique. Convert the analog filter into a digital filter whose system function is

$$H(s) = \frac{s + 0.5}{(s + 0.5^2) + 7}$$

Use the impulse invariant technique. Assume T=1 Sec.

5. Attempt any TWO of the followings. (10×2=20)

(a) Determine the Butterworth filter satisfying the following criteria

$$\sqrt{0.5} \leq \left|H(e^{jw})\right| \leq 1 \quad 0 \leq w \leq \frac{\pi}{2}$$

$$\left|H(e^{jw})\right| \leq 0.2 \quad \frac{3\pi}{4} \leq w \leq \pi$$

With T=1 Sec. Apply impulse invariant transformation method.

(b) Explain the different window design techniques with suitable examples.

(c) Discuss frequency sampling design techniques in detail with considering suitable examples.

*****