Q.6   Attempt any two:
i.   Give the applications of DSP processor.   **5**
ii.   Explain features and architectures of DSP processor.   **5**
iii.   Explain in detail Fixed point processor and Floating point processor.   **5**

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Enrollment No....................................

Faculty of Engineering
End Sem (Even) Examination May-2019
EC3CO06/EI3CO06 Digital Signal Processing

Knowledge is Power

Programme: B.Tech.   Branch/Specialisation: EC/EI

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1   i.   Frequency selectivity characteristics of DFT refers to   **1**
              (a) Ability to resolve different frequency components from input signal
              (b) Ability to translate into frequency domain
              (c) Ability to convert into discrete signal
              (d) None of these

      ii.   Which one is a FFT algorithm   **1**
              (a) Divide and conquer algorithm
              (b) Divide and rule algorithm
              (c) Split and rule algorithm
              (d) All of these

      iii.   Which window function is also regarded as 'Raised-cosine window'?   **1**
              (a) Hamming window   (b) Hanning window
              (c) Barlett window   (d) Blackman window

      iv.   The IIR filter designing involves   **1**
              (a) Designing of analog filter in analog domain and transforming into digital domain
              (b) Designing of digital filter in analog domain and transforming into digital domain
              (c) Designing of analog filter in digital domain and transforming into analog domain
              (d) Designing of digital filter in digital domain and transforming into analog domain

P.T.O.

v. The advantage of using the cascade form of realisation is **1**
    I. It has same number of poles and zeros as that of individual components
    II. The number of poles is the product of poles of individual components
    III. The number of zeros is the product of poles of individual components
    IV. Over all transfer function may be determined
    (a) I, II and III are correct   (b) I and III are correct
    (c) I and IV are correct   (d) All the four are correct

vi. The direct form II for realisation involves **1**
    I.   The realisation of transfer function into two parts
    II. Realisation after fraction
    III. Product of two transfer functions
    IV. Addition of two transfer functions
    (a) I, II and III are correct   (b) I and III are correct
    (c) III and IV are correct   (d) All the four are correct

vii. Correlation is used for **1**
    I.   Computation of average power in waveforms
    II. Climatography
    III. Identification of binary code word in PCM systems
    IV. Quantization
    (a) I, II and III are correct   (b) I and II are correct
    (c) II and III are correct   (d) All the four are correct

viii. Class of variable which can accept only values from set of integers is classified as **1**
    (a) Discrete random variable (b) Continuous random variable
    (c) Posterior random variable (d) Interior random variable

ix. In DSP processors, which among the following maintains the track of addresses of input data as well as the coefficients stored in data and program memories? **1**
    (a) Data Address Generators (DAGs)
    (b) Program sequences
    (c) Barrel Shifter
    (d) MAC

x. In TMS 320 C6x processor architecture, which operation/s is/are performed by 'M' functional unit? **1**
    (a) Bit expansion
    (b) Bit interleaving & deinterleaving
    (c) Rotation & Variable shifting
    (d) All of these

Q.2 i.   Determine IDFT of X (k) = {3, 2+j, 1, 2-j} **3**
     ii. Compute the N-point DFTs of the signals **7**
          (a) $x(n)=\cos n\pi/4$ if N=4
          (b) $x(n)=1/5$ for $-1<=n<=1$, 0 else
OR   iii. Given x(n)={0 1 2 3 },find X(k) using DIT FFT algorithm. **7**

Q.3 i.   Explain the windowing technique. **3**
     ii. Design the Butterworth filter that satisfies the following constraint using bilinear transformation. Assume T=1s **7**
          $$0.9 \le |H(e^{j\omega})| \le 1 \qquad 0 \le \omega \le \pi/2$$
          $$|H(e^{j\omega})| \le 0.2 \qquad 3\pi/4 \le \omega \le \pi$$
OR   iii. Determine the H(z) using impulse invariance method at 5Hz sampling frequency from **7**
          $$H_a(s) = 2/(s+1)(s+2)$$

Q.4 i.   Explain Telligen's theorem for digital filters and its applications. **3**
     ii. A difference equation describing a filter given bellow **7**
          $$y(n)-3/4y(n-1)+1/8\,y(n-2)=x(n)+1/2x(n-1)$$
          Draw Direct Form I and Direct Form II structure.
OR   iii. Realize the given system in cascade form, **7**
          $$y[n] = 0.5y[n-1] – 0.25y[n-2] +x[n]+ 0.4 x[n-1]$$

Q.5 i.   Explain central limit theorem. **3**
     ii. Find the cross-corellation of two finite length sequence, **7**
          $X_1(n)=\{1,2,1,1\}$
          $X_2(n)=\{1,1,2,1\}$
OR   iii. Explain power spectral density of random process. **7**

Marking Scheme
EC3CO06/EI3CO06 Digital Signal Processing

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(a) Hamming window

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(a) Designing of analog filter in analog domain and transforming into digital domain

v.   The advantage of using the cascade form of realisation is   **1**
(c) I and IV are correc

vi.   The direct form II for realisation involves   **1**
(b) I and III are correct

vii.   Correlation is used for   **1**
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(a) Discrete random variable

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Stepwise marking

OR   iii.   Given x(n)={0 1 2 3 },find X(k) using DIT FFT algorithm.   **7**
Stepwise marking

Q.3   i.   Explain the windowing technique.   **3**

ii.   Design the Butterworth filter   **7**

For N	2 marks
For $H_a(s)$	2 marks
For H(z)	2 marks
For corrections	1 mark

OR   iii.   Determine the H(z)using impulse invariance method   **7**

For partial fraction	3 marks
For transformation	3 marks
For answer	1 mark

Q.4   i.   Telligen's theorem for digital filters and its applications.   **3**

ii.   For H(z)   **7**

	3 marks
For direct form I	2 marks
For direct form II	2 marks

OR   iii.   Realize the given system in cascade form,   **7**
Stepwise marking

Q.5   i.   Explain central limit theorem.   **3**

ii.   Find the cross-corellation of two finite length sequence,   **7**

For formula	2 marks
For steps and answer	5 marks

OR   iii.   Power spectral density of random process.   **7**

Explanation	3 marks
Derivation	4 marks

Q.6   Attempt any two:

i.   Applications of DSP processor.   **5**
1 mark for each applications   (1 mark * 5)

ii.   Features   **5**

	3 marks
Architectures of DSP processor	2 marks

iii.   Fixed point processor   **5**

	2 marks
Floating point processor.	3 marks

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