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Question Paper Code: 55401

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2021

Fifth Semester

Electronics and Communication Engineering

15UEC501 - DIGITAL SIGNAL PROCESSING

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. DTFT is the representation of CO1-R
 - (a) Periodic Discrete time signals
 - (b) Aperiodic Discrete time signals
 - (c) Aperiodic continuous signals
 - (d) Periodic continuous signals

2. How to define IIR filters term as infinite: CO2-R
 - (a) As with any feedback device, create a loop, hence the term infinite.
 - (b) As with any non-feedback device, create a loop, hence the term infinite.
 - (c) As with any feedback device, create a open loop, hence the term infinite.
 - (d) None of above

3. FIR filters _____ CO3-R
 - (a) are non-recursive
 - (b) do not adopt any feedback
 - (c) are recursive
 - (d) use feedback

4. What is scaling? CO4-R
 - (a) Scaling must be done in such a way that no overflow occurs at the summing point
 - (b) Scaling must be done in such a way that overflow occurs at the summing point
 - (c) Scaling must be done in such a way that no underflow occurs at the summing point.
 - (d) None of above

5. The function of exponent encoder in TMS320C54x is CO5-App
- (a) to extract the exponent to form floating point data
 - (b) to add the exponent from floating point data
 - (c) to normalize the exponent of floating point data
 - (d) to add/extract the exponent of floating point data

PART – B (5 x 3= 15 Marks)

6. List the properties of DFT and explain. CO1-U
7. What is bilinear transformation? CO2- R
8. How to design a FIR filter using frequency-sampling method? CO3- R
9. What is meant by zero limit cycle oscillations? CO4- U
10. What is meant by pipelining? CO5- R

PART – C (5 x 16= 80Marks)

11. (a) Compute the 8-point DFT of the following sequence CO1- App (16)
 $x[n] = \{ 1, -1, 1, -1, 0, 0, 0, 0 \}$ using Decimation in Time FFT algorithm.
- Or
- (b) Find CO1- App (16)
 $y(n) = x(n) * h(n)$ for the sequences
 $x(n) = \{ 1, 2, -1, 2, 3, -2, -3, -1, 1, 1, 1, 2, -1 \}$ and $h(n) = \{ 1, 2 \}$.
 compare the result by solving the problem using overlap save method and overlap add method.
12. (a) Design a Butterworth Lowpass filter with $T = 1$ sec satisfying the CO2- App (16)
 following constraints
 using Bilinear transformation.

$$0.707 \leq |H(e^{j\omega})| \leq 1 \quad \text{for } 0 \leq \omega \leq \pi/2$$

$$|H(e^{j\omega})| \leq 0.2 \quad \text{for } 3\pi/4 \leq \omega \leq \pi$$
 Realize the filter using the most convenient realization form.
- Or
- (b) (i) For the analog transfer function CO2- App (8)

$$H(s) = \frac{2}{(s+1)(s+2)}$$
 Determine $H(z)$ using impulse invariant method. Assume $T=1$ sec

- (ii) Obtain the cascade and parallel realization for the system function given by

$$H(z) = \frac{1+0.25Z^{-1}}{(1+0.5Z^{-1})(1+0.5Z^{-1}+0.25Z^{-2})}$$

13. (a) Design an FIR low pass filter of length 7 using Hamming window: CO3- App (16)

$$H(e^{j\omega}) = \begin{cases} 1 & 0 \leq |\omega| \leq 0.5\pi \\ 0 & 0.6\pi \leq |\omega| \leq \pi \end{cases}$$

Or

- (b) (i) State and explain the properties of FIR filters. State their importance. CO3- App (8)
(ii) Explain linear phase FIR structures. What are the advantages of such structures? CO3- App (8)

14. (a) Examine the limit cycle behavior of the system $y(n) = 0.7y(n-1) + x(n)$ and compute the dead band of the above system for the input $x(n) = 0.875$ for $n=0$
 $= 0$ otherwise

Or

- (b) Study the limit cycle behavior of the system $y(n) = 0.95y(n-1) + x(n)$, when the product is quantized by rounding and five bit sign-magnitude binary representation is used. CO4- App (16)
15. (a) (i) Describe the architecture of TMS320C6713 processor with suitable block diagram. CO5- U (8)
(ii) Develop a program to implement DFT in 'C67x processor CO5- U (8)
- Or
- (b) (i) Explain about the instruction pipelining concept with diagram. CO5- U (8)
(ii) Explain the operation of TDM serial ports in P-DSPs.. CO5- U (8)

