C **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 55401

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

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. Calculate $F = W^N$ for the given $W = e^{-\frac{j2\pi}{N}}$ where $N = 3$. CO1-R

   (a) 0 (b) 1 (c) -1 (d) None of above

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. For the rectangular window function, the first side lobe will be _____ dB down the peak of the main lobe. CO3- R

   (a) 12 dB (b) 11 dB (c) 13 dB (d) 14 dB

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. What is the RAM size of TMS320C50 processor? CO5- App

a) 1k x 32 bits b) 2k x 32 bits c) 2k x 16 bits d) 2k x 64 bits

PART – B (5 x 3= 15 Marks)

6. Compare the number of multiplications required to compute the DFT of a 64 point sequence using direct computation and that using FFT. CO1-U

7. What is bilinear transformation? What are the main advantages of this technique? CO2- R

8. Write the window function of Hamming window and Hanning window. CO3- R

9. What is meant by product quantization error? CO4- U

10. What are the addressing modes of TMS320C54x processors? CO5- R

PART – C (5 x 16= 80Marks)

11. (a) Determine the FFT of a sequence x(n)={1,2,3,4,4,3,2,1} using DIT-FFT algorithm. CO1- App (16)

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 filter with the following characteristics using bilinear transformation method using T=1sec CO2- App (16)

$$0.8 \leq \left| H(e^{j\omega}) \right| \leq 1 \quad \text{for } 0 \leq \omega \leq 0.2\pi$$

$$\left| H(e^{j\omega}) \right| \leq 0.2 \quad \text{for } 0.6\pi \leq \omega \leq \pi$$

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=1sec

(ii) Obtain the cascade and parallel realization for the system function given by CO2- App (8)

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

13. (a) Design a FIR filter with the following characteristics using rectangular window with N=7. Determine h (n),H (Z) and draw the Linear Phase Filter structure. CO3- App (16)

$Hd(e^{j\omega}) = 1, \quad 0 \leq |\omega| \leq \pi/2$

$= 0, \quad \pi/2 \leq |\omega| < \pi$

Or

(b) (i) State and explain the properties of FIR filters. State their importance. CO3- U (8)

(ii) Explain linear phase FIR structures. What are the advantages of such structures? CO3- U (8)

14. (a) Explain briefly about the truncation and rounding errors using fixed point and floating point representation. CO4- U (16)

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) Explain DSP building block, multipliers, shifters, MAC unit of a typical DSP processor. CO5- U (16)

Or

(b) Explain the architecture of TMS320C50. CO5- U (16)

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