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

Question Paper Code: 55401

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2024

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 following constraints CO2- App (16)
using Bilinear transformation.

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

$$|H(e^{j\omega}| \leq 0.2 \text{ for } 3\pi/4 \leq \omega \leq \pi$$

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=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 an FIR low pass filter of length 7 using Hamming window: CO3- App (16)

$$H(e^{j\omega}) = 1 \quad 0 \le |\omega| \le 0.5\pi$$
$$= 0 \quad 0.6\pi \le |\omega| \le \pi$$

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 CO4- App (16)

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)

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