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



**PRESIDENCY UNIVERSITY**

**Bengaluru**

|  |
| --- |
| **End - Term Examinations – JANUARY 2025** |
| **Date:** 04- 01- 2025 **Time:** 1:00 pm – 04:00 pm |

|  |  |  |
| --- | --- | --- |
| **School :** SOE | **Program :** B.Tech - (VLSI) | |
| **Course Code :** ECE3109 | **Course Name :** SIGNAL PROCESSING | |
| **Semester** : III | **Max Marks** : 100 | **Weightage** : **50%** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CO - Levels** | **CO1** | **CO2** | **CO3** | **CO4** | **CO5** |
| **Marks** | **17** | **25** | **29** | **29** | **NA** |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Do not write anything on the question paper other than roll number.*

**Part A**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Answer ALL the Questions. 10 X 2 Marks=20 Marks** | | | | |
| **1** | **For large data signal processing in DSP-based devices, Overlap Add and Save methods are used. It is used to compute the\_\_\_\_\_\_\_\_\_\_\_\_** | **2 Marks** | **L1** | **CO2** |
| **2** | **The circular convolution of two sequences in time domain is equivalent to**   1. **IDFT of Summation of DFTs of two sequences** 2. **IDFT of Multiplication of DFTs of two sequences** 3. **Summation of IDFTs of two sequences** 4. **Multiplication of IDFTs of two sequences** | **2 Marks** | **L1** | **CO2** |
| **3** | **Radix 2 Decimation-in frequency FFT algorithm is used to compute\_\_\_\_\_\_\_\_\_** | **2 Marks** | **L1** | **CO2** |
| **4** | **A unit step signal is a specific type of input signal used for analysis, testing and designing. The discrete unit step function is defined as\_\_\_\_\_\_\_\_\_\_\_\_\_\_** | **2 Marks** | **L1** | **CO1** |
| **5** | **How many complex multiplications are need to find N point DFT using formula method (Direct Method)?** | **2 Marks** | **L1** | **CO2** |
| **6** | **If x(n)={ 2,1,0,1}, then Discrete Fourier Transform X(0) is\_\_\_\_\_\_\_\_** | **2 Marks** | **L1** | **CO2** |
| **7** | **IIR digital filter is\_\_\_\_\_\_\_\_(** **Recursive / Non-Recursive)** | **2 Marks** | **L1** | **CO3** |
| **8** | *H(z)=(1/2)+(1/3)z-1+z-2+(1/4)z-3+z-4+(1/3)z-5+(1/2) z-6*  **For the given transfer function, how many minimum multipliers are needed in linear phase implementation?** | **2 Marks** | **L1** | **CO4** |
| **9** | **Identify the filter type, for the given difference equation**  *y(n)=2x(n)+3x(n-1)+x(n-2)+4x(n-3)+x(n-4)+3x(n-5)+2x(n-6)* | **2 Marks** | **L1** | **CO4** |
| **10** | **No. of memory needed to design a Direct Form-I filter for the equation,**  *y(n)+2y(n-1)=x(n)+5x(n-1)-4X(n-2) is \_\_\_\_* | **2 Marks** | **L1** | **CO3** |

**Part B**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Answer the Questions. Total Marks 80** | | | | | |
| **11.** | **a.**  **b.** | **For the given desired frequency response,**    **with length N= 9, Using rectangular window, Design FIR filter with frequency response:**  **For the given difference equation, obtain the structure using minimum multiplier**  *y(n)=7x(n)+3x(n-1)+2x(n-2)+2x(n-3)+3x(n-4)+7x(n-5)* | **25 Marks** | **L3** | **CO4** |
| **Or** | | | | | |
| **12.** | **a.**  **b.** | **For the given desired frequency response**    **with length N=11, Using rectangular window, Design FIR filter and find frequency response?**  **For the given difference equation, obtain the Direct form realization:**  *y(n)=3x(n)+3x(n-1)+2x(n-2)+2x(n-3)+3x(n-4)+3x(n-5)* | **25 Marks** | **L3** | **CO4** |
|  |  |  |  |  |  |
| **13.** | **a.**  **b.** | **For the given difference equation, obtain the Direct form-I realization**  *y(n)=0.5y(n-1)+0.6y(n-2)+0.7y(n-3)+0.3x(n)+0.4x(n-1)+2x(n-2)+3x(n-3 )*  **An analog filter has a transfer function ,**  **Design a Digital filter using Impulse Invariant Method when T=0.2 sec:** | **25 Marks** | **L3** | **CO3** |
| **Or** | | | | | |
| **14.** | **a.**  **b.** | **Using Bilinear Transformation Method, Fid H(z) when**    **For the given difference equation, obtain the Parallel form**  *y(n) + 0.1y(n-1) - 0.72y(n-2) = 0.7x(n) - 0.252x(n-1)* | **25 Marks** | **L3** | **CO3** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **15.** | **a.** | **By using DFT/FFT and IDFT/IFFT find the circular convolution for the given two sequences and verify your answer using the matrix method.** | **15**  **Marks** | **L2** | **CO2** |
| **Or** | | | | | |
| **16.** | **a.** | **Using radix2-DITFFT algorithm, compute Fourier Transform for the given sequence** | **15 Marks** | **L2** | **CO2** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **17.** | **a.** | **Find y(n) for the given x(n) and h(n) by using Overlap Add Method, Where** | **15**  **Marks** | **L2** | **CO1** |
| **Or** | | | | | |
| **18.** | **a.** | **Find y(n) for the given x(n) and h(n) by using Overlap Save Method, Where** | **15**  **Marks** | **L2** | **CO1** |

**\*\*\*\*\* BEST WISHES \*\*\*\*\***