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

PRESIDENCY UNIVERSITY BENGALURU

SCHOOL OF ENGINEERING

SUMMER TERM END TERM EXAMINATION - AUGUST 2024

|  |  |
| --- | --- |
| **Semester : 4** | **Date :7-8-2024** |
| **Course Code : CSA3056** | **Time :9:30AM- 12:30PM** |
| **Course Name : INTELLIGENT SIGNAL PROCESSING** | **Max Marks :100** |
| **Program :BCA** | **Weightage :50%** |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Question paper consists of 3 parts.*
3. *Scientific and non-programmable calculator are permitted.*
4. *Do not write any information on the question paper other than Roll Number.*

|  |  |  |  |
| --- | --- | --- | --- |
| **PART A** | | | |
| **ANSWER ANY 5 QUESTIONS 5Q X 4M=20M** | | | |
| 1 | Signal processing is a field of engineering, mathematics, and computer science that deals with processing, analyzing, and manipulating analog and digital signals. What is aliasing during sampling ? | (CO 1) | [Knowledge] |
|  | | | |
| 2 | **Adaptive filtering** is a class of algorithms that can adapt to changing signals or environments. Multiply the two signals, and . | (CO 1) | [Application] |
|  | | | |
| 3 | **Convolution** is an algorithm that is used to perform filtering, prediction, and smoothing of signals. Convolve the given two discrete signals using tabulation method, and . | (CO 2) | [Application] |
|  | | | |
| 4 | Signal processing techniques are used in biomedical engineering to analyze and interpret signals from medical devices such as electrocardiograms (ECGs) and magnetic resonance imaging (MRI) scanners. Compare DIT- FFT and DIF FFT. | (CO 2) | [Knowledge] |
|  | | | |
| 5 | Signal processing techniques are used in a wide range of applications, including telecommunications, audio and video processing, image processing, speech recognition, and control systems. Why Fast Fourier Transform is needed? | (CO3) | [Knowledge] |
|  | | | |
| 6 | Feature Extraction is the process of identifying or estimating a desired representative signal component. Write about the compression modes of MPEG. | (CO 3) | [Knowledge] |
|  |  |  |  |
| 7 | The disciplines of signal and image processing are concerned with the analysis and synthesis of signals and their interaction with systems. Why we need compression in digital data? | (CO 4) | [Knowledge] |

|  |  |  |  |
| --- | --- | --- | --- |
| **PART B** | | | |
| **ANSWER ANY 4 QUESTIONS 4Q X 10M=40M** | | | |
| 8 | Many signals and systems change over time, and modeling and analyzing these time-varying systems can be challenging. Perform circular convolution of the two sequences, and . | (CO 1) | [Application] |
|  | | | |
| 9 | Control is a process of generating and injecting a signal to properly guide a system’s operation. Find whether the following signals are odd or even.   1. b) | (CO 1) | [Application] |
|  | | | |
| 10 | The bandwidth of a communication channel is the range of frequencies over which it can transmit signals. Explain in detail about sampling theorem. | (CO 2) | [Comprehension] |
|  | | | |
| 11 | Lossy compression, also known as irreversible compression, is a data compression method that reduces file size by permanently removing some information. Explain in details about predictive coding and variable length coding. | (CO 3) | [Comprehension] |
|  | | | |
| 12 | Coding is to convert a signal to a different format so that it may be more immune to interference, or better suited for storage or transmission. Find the 4-point DFT for the sequences, . | (CO 3) | [Application] |
|  | | | |
| 13 | The file format is the structure of a file that tells a program how to display its contents. Write about audio and video file formats with suitable examples. | (CO 4) | [Application] |

|  |  |  |  |
| --- | --- | --- | --- |
| **PART C** | | | |
| **ANSWER ANY 2 QUESTIONS 2Q X 20M=40M** | | | |
| 14 | A complex number has real and imaginary parts, complex number notation is also useful for compactly representing signals having two independent components. Compute 4-point DFT and 8-point DFT of causal three sample sequence is given by, . | (CO 1) | [Application] |
|  | | | |
| 15 | Analog and digital signal processing are based on similar theories and mathematics; these include calculus, differential and difference equations, and complex numbers. Apply Shannon Fano coding and Huffman coding for the following source and its probabilities, P(A)= 0.30, P(B)= 0.10, P(C)= 0.02, P(D)= 0.15, P(E)= 0.40, P(F)= 0.03. | (CO 2) | [Comprehension] |
|  | | | |
| 16 | Analog signals are electrical representations of waveforms originally found in other forms, such as pressure or temperature. Explain in detail about MPEG Compression. | (CO 4) | [Comprehension] |