Exam Date & Time: 12-Dec-2023 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

Department of Electronics and Communication Enginnering

APPLICATIONS OF SIGNAL PROCESSING [ECE 4309]

Marks: 50 **Duration: 180 mins.**

Descriptive

Answer all the questions.

Data missing if any, may be suitably assumed.

1A) Describe (i) Periodic versus non-periodic and (ii) Even versus odd signals. Give continuous-time and discrete-time examples for each. (4)

1B) Define time-invariance and causality properties of system. Explain with examples. (3)

1C) Define and plot any three elementary signals. Give both discrete-time and continuous-time versions of elementary signals. (3)

2A) What are the four Fourier tools for spectral analysis? Define Fourier series and Fourier transforms. (4)

2B) Find the energy of a continuous-time signal, $x(t) = \begin{cases} 2, for -1 \leq t \leq 1 \\ 0, Otherwise \end{cases}$. What is its average power? Determine the signal type. (3)

2C) Obtain the frequency response of low-pass and band-stop filters. Clearly show all the specifications of filters. (3)

3A) Explain the role of Larynx and vocal folds in the production of speech. (4)

3B) What are the characteristics of voiced and unvoiced speech signals? Explain using time domain plots and examples. (3)

3C) What are “Whisper”, “Fricative” and “Plosive” sounds? Explain based on the vocal fold positions and using suitable examples. (3)

4A) What are the fundamental steps in Digital Image Processing? Explain each of them with help of block diagram. (4)

4B) Explain the image sampling and quantization process. (3)

4C)	With the neat block diagram explain the task-oriented speech recognition by machine. What are the various approaches to automatic speech recognition by machine? Explain.	(3)
5A)	Describe the three types of adjacency of pixels in a gray scale image and hence explain the connectivity between pixels.	(4)
5B)	With help of necessary expressions and block diagram, explain short-time average zero-crossing rate. How it is useful in speech processing? What are its limitations?	(3)
5C)	What are the different Image coding techniques? With the help of block diagram, explain any one of the image coding method.	(3)

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