

Digital Information Age An Introduction to Electrical Engineering 2nd Edition Roman

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Chapter 5

Converting Between Analog & Digital Signals

5.1 Problems

Problem 5.1 (Sampling audio waveforms) *A talking book generates a digital audio waveform that was generated by sampling the original audio waveform 2,000 times a s. What is the maximum allowed frequency for proper operation?*

(ans:

$$f_s = 2,000 \text{ Hz} \rightarrow f_{max} < \frac{f_s}{2} = 1,000 \text{ Hz}$$

)

Problem 5.2 (Cell phone audio waveforms) *The audio signals on your cell phone occupy the frequency range from 300Hz to 3,400Hz. What sampling frequency would you specify for digitizing the voice waveform?*

(ans:

$$f_{max} = 3,400 \text{ Hz} \rightarrow f_s > 2f_{max} = 6,800 \text{ Hz}$$

Many systems use $f_s = 8,000 \text{ Hz}$ as the standard.

)

Problem 5.3 (Cell phone HD Voice waveforms) *The HD Voice systems for cell phone systems occupy the frequency range from 50Hz to 7,000Hz and permit high-quality speech to be transmitted. What sampling frequency would you specify for digitizing the voice waveform?*

(ans:

$$f_{max} = 7,000 \text{ Hz} \rightarrow f_s > 2f_{max} = 14,000 \text{ Hz}$$

A reasonable value falls in the range $15,000 < f_s < 20,000 \text{ Hz}$.

)

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M Tight



Digital Information Age An Introduction To Electrical Engineering:

Unveiling the Energy of Verbal Art: An Psychological Sojourn through **Digital Information Age An Introduction To Electrical Engineering**

In a global inundated with monitors and the cacophony of quick communication, the profound energy and emotional resonance of verbal art often disappear in to obscurity, eclipsed by the regular barrage of sound and distractions. Yet, located within the lyrical pages of **Digital Information Age An Introduction To Electrical Engineering**, a charming perform of fictional beauty that impulses with fresh emotions, lies an wonderful trip waiting to be embarked upon. Written by a virtuoso wordsmith, this mesmerizing opus guides readers on an emotional odyssey, delicately revealing the latent possible and profound influence stuck within the intricate web of language. Within the heart-wrenching expanse with this evocative examination, we can embark upon an introspective exploration of the book is main themes, dissect their fascinating publishing fashion, and immerse ourselves in the indelible impression it leaves upon the depths of readers souls.

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