

Ex/SC/INSC/PG/CORE/TH/MI 304B/2024

MASTER OF SCIENCE EXAMINATION, 2024

(2nd Year, 1st Semester)

INSTRUMENTATION SCIENCE

PRINCIPLES OF DIGITAL SIGNAL PROCESSING

PAPER : MI 304B

Time : Two Hours

Full Marks : 40

Answer **any four** questions, each question carries 10 Marks.

1. Establish mathematically the sampling theorem i.e. a minimum sampling rate along with plots of the sampled signal spectrum.
10
2. Discuss in details with spectrum diagram the reconstruction of analog signal from its sampled signal version for $f_s = 2f_{\max}$, $f_s > 2f_{\max}$, $f_s < 2f_{\max}$, where f_s is sampling frequency and $f_{\max}$ is the max frequency of the analog signal.
10
3. (a) Compare Bilateral Laplace Transform with Fourier Transform with physical significance.
(b) Describe sinc function with its remarkable features.
6+4
4. Describe mathematically the two convolution theorems one for the time domain and another for the frequency domain.
5+5

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[Turn Over]

(2)

5. Given the digital transfer function :

$H(z) = (z^{-1} - 0.5z^{-1}) / (1 + 1.2z^{-1} + 0.45z^{-2})$. Plot Poles and zeros.
10

6. Describe in brief special digital signal processor hardware unit like (a) Multiplier and Accumulator, (b) Shifter, and (c) Address Generators.
3+3+4
7. Describe in details the working of a dual slope ADC. Design an Ohmmeter using the ratio metric feature of this ADC.
6+4

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