



বাংলাদেশ আর্মি ইন্টারন্যাশনাল ইউনিভার্সিটি অব সায়েন্স এন্ড টেকনোলজি (বিএআইইউএসটি), কুমিল্লা
BANGLADESH ARMY INTERNATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY (BAIUST), CUMILLA

Department of Electrical and Electronic Engineering
Level-3, Term-II

Term Final Examination, Spring-2023

Course Code: EEE 315

Course Title: Digital Signal Processing I

Notes:

Time: 1 Hour

a. Each question carries 30 marks.

Full Marks: 60

b. Figure on the right of each question indicate marks for respective question.

ANSWER ANY TWO QUESTIONS INCLUDING QUESTION NO. 1

1. a. How are the Dirichlet's conditions related with Fourier series? (05)

b. Determine the magnitude and phase spectrum of the following function if $T=5\text{sec}$ and $A=10$. Comment on the magnitude value if $T=10\text{sec}$ and $A=5$. (10)

$$f(t) = \begin{cases} A, & \text{for } -T \leq t \leq 0 \\ -A, & \text{for } 0 \leq t \leq T \\ 0, & \text{otherwise} \end{cases}$$

c. Obtain the Fourier components of the following periodic rectangular function: (15)

$$f(t) = \begin{cases} 0, & \text{for } -T/2 < t < -T/4 \\ A, & \text{for } -T/4 < t < T/4 \\ 0, & \text{for } T/4 < t < T/2 \end{cases}$$

2. a. Determine the z-transform including the region of convergence of (05)

$$x(n) = \begin{cases} a^n, & n \geq 0 \\ 0, & n < 0 \end{cases}$$

b. Determine the cross-correlation sequence of the discrete signals: (10)

$$x_1(n) = \{1, 2, 3, 4\}$$

$$x_2(n) = \{4, 3, 2, 1\}$$

- c. Determine the inverse z-transform of the system function: (15)

$$H(z) = \frac{z^2 - 3z + 8}{(z - 2)(z + 2)(z + 3)}$$

3. a. How can you remove the aliasing effect? (5)
- b. Draw and explain the block diagram of the analog to digital signal conversion process. (10)
- c. If the continuous-time signal $x(t) = 2\cos(400\pi t) + 5\sin(1200\pi t) + 6\cos(4400\pi t) + 2\sin(5200\pi t)$ is sampled at a 8 kHz rate generating the sequence $x[n]$, find $x[n]$. (15)

