



International Islamic University Chittagong (IIUC)
Department of Computer Science and Engineering (CSE)
Semester Final Examination

Program: B. Sc. in CSE
Course Code: MATH-2407
Time: 2:30 hours

Semester: Spring-2024
Course Title: Mathematics-IV
Total Marks: 50

- (i) Answer all the questions. The figures in the right-hand margin indicate full marks.
(ii) Please answer the several parts of a question sequentially.
(iii) Separate answer script must be used for separate group.
(iv) Course Learning Outcomes (CLOs) and Bloom's Levels are mentioned in additional Columns.

Course Learning Outcomes (CLOs) of the Questions

CLO1:	Demonstrate the understanding of the basic principles and operations set theory, mathematical operations with complex numbers, geometrical interpretation and the related fundamental theories involving complex functions and the concept of transformation in a complex plane.
CLO2:	Understanding the behavior of complex wave, periodic functions, and aperiodic functions, stable signal, unstable signal, impulse signal, unit step function, ramp function, convolution theorem.
CLO3:	Use Fourier series, Laplace's Transforms, Inverse Laplace's Transform, Fourier Transform in different scenario.
CLO4:	Analyze the harmonics & spectrum of different types of waves.
CLOS:	Demonstrate the harmonic analysis using MATLAB.

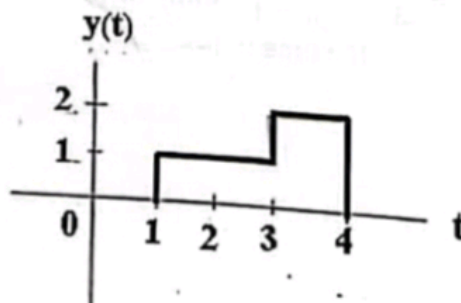
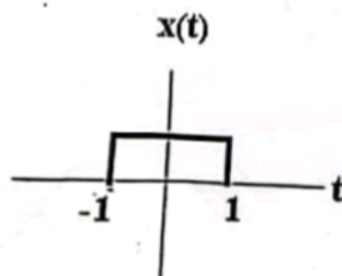
Bloom's Taxonomy Domain Levels of the Questions

Letter Symbols	R	U	Ap	An	E	C
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

GROUP-A

- | | | | | | |
|----|----|---|-------|------|----|
| 1. | a) | What is obtained by breaking down a complex wave? | Marks | CLO | DL |
| | b) | Find the complex form of the periodic function $f(t)$ is given by: | 01 | CLO2 | U |
| | | $f(t) = \cos \frac{1}{2}t \quad ; -\pi < t < \pi \quad [T = 2L = 2\pi]$ | 09 | CLO3 | U |
| 2. | a) | Evaluate the convolution sums of $y[n] = x[n] * h[n]$ | | | |
| | | Where, | | | |
| | | $x[n] = \begin{cases} 1, & n = 0 \\ 3, & n = 1 \end{cases}$ and $h[n] = \begin{cases} 2, & n = 0 \\ 1, & n = 1 \end{cases}$ | 08 | CLO2 | U |
| | | Where, n represents the time index. | | | |
| | | Or | | | |

Find convolution integral of $x_1(t) * x_2(t)$



- b) If $x = \cos 3t + \frac{1}{4} \sin 4t$ then find the amplitude of the new signal and the phase shift.

Or

$$y = f(t) = 0; \quad -\pi \leq t < 0$$

$$= t; \quad 0 \leq t < \pi$$

Here, $T = 2L = 2\pi$ $\therefore L = \pi$

Sketch the function for 3 cycles

GROUP-B

		Marks	CLO	DL
3.	a) Find the Fourier transform of $f(t) = \begin{cases} 1 + \frac{t}{a}, & -a < t < 0 \\ 1 - \frac{t}{a}, & 0 < t < a \\ 0, & \text{otherwise} \end{cases}$	5	CLO3	U
	Or Find the Laplace transform of the functions: $f(t) = \sin at$			
	b) Express the following function in terms of unit step functions and hence find its Laplace transform $f(t) = \begin{cases} 8; & t < 2 \\ 6; & t > 2 \end{cases}$	5	CLO3	U
4.	a) Evaluate $\mathcal{L}\left\{\frac{\sin 2t}{t}\right\}$ using the division theorem.	5	CLO3	U
	Or Solve the Initial Value Problem (IVP) by Laplace Transformation, $Y'' - 3Y' + 2Y = 4e^{2t}$, $Y(0) = -3$, $Y'(0) = 5$			
	b) Draw the graph of the following functions i. $-2u(t+3)$ ii. $x(t-2)$ iii. $3\delta(t-2)$	3	CLO2	U
	c) Plot the line spectrum (at least 2) for the following Fourier series: $f(t) = \frac{\pi^2}{3} + \sum_{n=1}^{500} \frac{(-1)^{2n}}{n^2} \cos n\pi t$	2	CLO2	U
5.	a) Write a user defined MATLAB function to reconstruct $f(t)$ in the time interval of $[-4, 20]$ for the following complex wave $f(t) = 2\pi + \sum_{n=1}^{500} \frac{2}{n} \cos 2n\pi t$	4	CLO5	App
	b) Write MATLAB code for the following unit step function $5u(t) + 6u(t+2) - 7u(t-1)$	4	CLO5	App
	c) Write MATLAB code to find the convolution sums of $y[n] = x[n] * h[n]$ Where, $x[n] = \begin{cases} 2, & n = 0 \\ 3, & n = 1 \end{cases} \text{ and } h[n] = \begin{cases} 3, & n = 0 \\ 1, & n = 1 \end{cases}$	2	CLO5	App

Where, n represents the time index.