International Islamic University Chittagong
Department of Electrical and Electronic Engineering

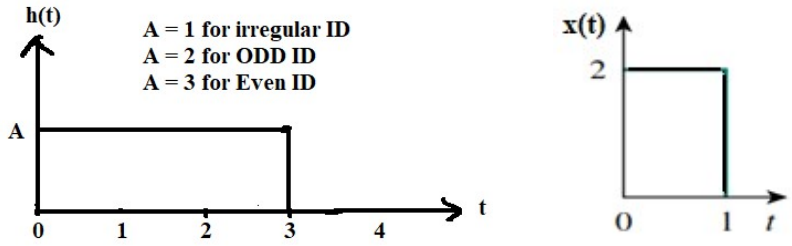
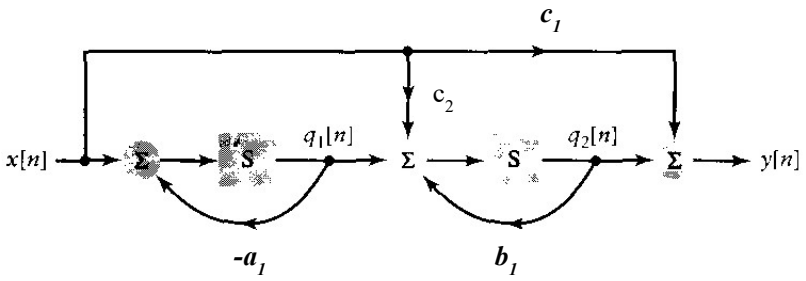
Final Assessment of Autumn-2020	Program: B.Sc. Engg. (EEE)
Course Code: **EEE-3501**	Course Title: **Continuous Signals and Linear Systems**
Time: **5 hours** (Writing - **4 hours 30 minutes** + **30 minutes** submission time)	Full Marks: **50** [**Written**-30 + **Viva**-10 +**Quiz**-10]

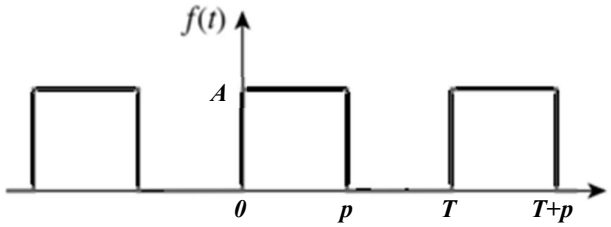
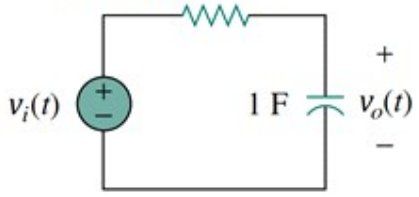
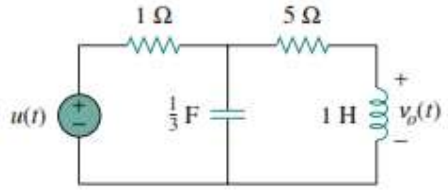
[Answer **each of the** questions from the followings; Figures in the right margin indicate full marks. **Answer script must be submitted through online method within 5 hours from starting time. Also, write down the Q. Set on the front page of your answer script]**

Course Outcomes

S/N	**Course Outcomes (COs):** Upon the successful completion of the course, students will be able to	Corres-ponding POs	Bloom's taxonomy domain/level
CO-1	Strengthen knowledge of about signal, system, properties of signal and system, and representation of system by means of differential equation.	PO-1	Cognitive/ Understanding
CO-2	Learn, analyze, and apply the important mathematical tools such as convolution, Fourier analysis, Laplace transformation for the analysis of the signals and systems of circuit applications.	PO-2	Cognitive / Applying

Q. Set-B

Q1	Convolution integral is widely used to determine the system properties. The impulse response and input signal of a system are given below.  Answer the following questions.			
1(a).	**Define** the convolution integral. And **Why** is it an invaluable tool for the engineer?	**CO2**	**R,U**	**01**
1(b).	**Evaluate** the convolution integral between h(t) and x(t) to get the system output y(t) = h(t)*x(t).	**CO2**	**E**	**03**
1(c).	**Formulate** the state variable description corresponding to the second-order system depicted in the Figure below by choosing state variables to be the outputs of the unit delays. [*Symbol S represents unit delay*] 	**CO2**	**C**	**02**
Q2	Analysis of electrical systems with non-sinusoidal periodic excitation and Analysis of Frequency spectrum of signals are two main applications			

	of Fourier Series in electrical engineering. A non-sinusoidal periodic excitation to an electrical system is given below for Fourier Analysis.  *Here, A = ID last digit + 1, p = ID second last digit + 1 = T/2.* Answer the following questions.			
2(a).	**What** do you mean by Fourier Coefficient and Fourier Analysis?	**CO2**	**U**	**01**
2(b).	**Formulate** the Fourier Series of the given signal.	**CO2**	**C**	**03**
2(c).	**Determine** the Frequency Spectrum of the signal.	**CO2**	**E**	**02**
Q3	A system is given below for analysis using Fourier Transform. **(ID last digit + 1) Ω**  			
3(a).	**What** are the steps for the circuit analysis using Fourier Transform?	**CO2**	**R**	**01**
3(b).	**Determine** the output of the system using Fourier Transform for $v_i(t) = (ID\ last\ digit + 1)e^{-(ID\ second\ last\ digit+1)t}\ u(t)$	**CO2**	**E**	**03**
3(c).	Among the phasor, Fourier Series, and Fourier Transform, which one will you select for doing circuit analysis and why? **Explain** briefly.	**CO2**	**E**	**02**
Q4	Laplace transform is an important mathematical tool for signals and systems engineering for doing signals and systems analysis in the frequency domain. Consider the system below and answer the following questions.  			
4(a).	**What** are the significances of Laplace Transformation?	**CO2**	**Ap**	**01**
4(b).	**Determine** the output and transfer function of the system using Laplace transformation.	**CO2**	**E**	**03**
4(c).	Use the Laplace transform to **solve** the system differential equation $\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 8y(t) = 2u(t)$ $subject\ to\ y(0) = 1, y'(0) = -(ID\ last\ digit + 1).$	**CO2**	**C**	**02**
Q5				
5(a).	**Define** transfer function, complex plane, LHP, and RHP. Is the system in 4(b) stable? **Explain** with proper reasoning.	**CO2**	**R,E**	**3.5**

	[*Writing just stable or unstable or marginally stable without giving logical explanation will provide you with zero marks.*]			
5(b).	**Define** Amplitude Modulation. If a 2-MHz carrier is modulated by a 4-kHz intelligent signal, determine the frequencies of the three components of the AM signal that results.	**CO2**	**R,E**	**01**
5(c).	**What** is multiplexing? Explain TDM and FDM with proper diagram.	**CO2**	**R,E**	**1.5**
6.	Viva/Viva-Quiz: The time of viva/viva-quiz will be declared in google classroom.	**CO2**	**R**	**20**