

Faculty of Engineering and Technology			
Ramaiah University of Applied Sciences			
Department	Electronic and Communication Engineering	Programme	B. Tech. in CSE
Semester/Batch	4 <sup>th</sup> /2017		
Course Code	ECC201A	Course Title	Signals and Systems
Course Leader(s)	Ms Prafulla Kumari K. S. & Dr T. Christy Bobby		

Assignment – 01			
Reg.No.		Name of Student	

Sections	Marking Scheme		Marks		
			Max Marks	First Examiner Marks	Moderator
Part A					
	A	Difference Equations for the Analysis of Time Series	5		
		<b>Part-A Max Marks</b>	<b>5</b>		
Part B					
	B 1.1	NRZ encoding of the text string	2		
	B 1.2	Plot of the Continuous Time (CT) signal for the entire string	4		
	B 1.3	Energy of the CT signal and the energy per character	4		
		<b>B.1 Max Marks</b>	<b>10</b>		
	B 2.1	Signal received by the second link	4		
	B 2.2	Signal received at the destination	4		
	B 2.3	Overall impulse response of the network	2		
		<b>B.2 Max Marks</b>	<b>10</b>		
<b>Total Assignment Marks</b>			<b>25</b>		

Course Marks Tabulation				
Component-1 (B) Assignment	First Examiner	Remarks	Moderator	Remarks
A				
B.1				
B.2				
Marks (Max 25 )				
Signature of First Examiner		Signature of Moderator		

**Please note:**

1. Documental evidence for all the components/parts of the assessment such as the reports, photographs, laboratory exam / tool tests are required to be attached to the assignment report in a proper order.
2. The First Examiner is required to mark the comments in RED ink and the Second Examiner's comments should be in GREEN ink.
3. The marks for all the questions of the assignment have to be written only in the **Component – CET B: Assignment** table.
4. If the variation between the marks awarded by the first examiner and the second examiner lies within +/- 3 marks, then the marks allotted by the first examiner is considered to be final. If the variation is more than +/- 3 marks then both the examiners should resolve the issue in consultation with the Chairman BoE.

**Assignment - 01**  
**Term - 1**

**Instructions to students:**

1. The assignment consists of 3 questions: Part A – 1 Question, Part B – 2 Questions.
2. Maximum marks is 25.
3. The assignment has to be neatly word processed as per the prescribed format.
4. The maximum number of pages should be restricted to 12.
5. Restrict your report for Part-A to 2 pages only.
6. Restrict your report for Part-B to a maximum of 10 pages.
7. The printed assignment must be submitted to the course leader.
8. **Submission Date:**
9. **Submission after the due date is not permitted.**
10. **IMPORTANT:** It is essential that all the sources used in preparation of the assignment must be suitably referenced in the text.
11. Marks will be awarded only to the sections and subsections clearly indicated as per the problem statement/exercise/question

## Preamble

This course deals with continuous-time and discrete-time signals and systems. Students are taught the various continuous-time and discrete-time signals and systems, the underlying mathematics required for analysis and understanding of signals and systems including Fourier theory, Laplace and Z-transforms. Students are also taught to perform time and frequency domain analysis of systems including stability and are exposed to software tools for solving signals and systems problems.

## Part-A

(05 Marks)

Internet of Things (IoT) creates a inter-network of sensor networks employed to monitor a variety of real-time systems such as road traffic and environmental pollution. A general monitoring approach involves a set of sensors measuring the value of a parameter used in the monitoring at different location in a synchronous or asynchronous fashion. The output of each of the sensors at discrete time instances is termed a Time Series.

In this context, write an essay on the topic : **“Role of Difference Equations in the Analysis of Time Series”**.

## Part B

(20 Marks)

### B.1

(10 Marks)

A communication system encodes English text characters in using binary NRZ encoding. It has a transmission rate of 1 Megabits per second (Mbps) and uses sine wave pulses of amplitude 3.5V to generate the signal pulses for each character. The frequencies used for 0 and 1 bits are 10 MHz and 5 MHz respectively.

**B.1.1** Derive the NRZ encoding of the text string.

**B.1.2** Determine and plot the Continuous Time (CT) signal for the entire string.

**B.1.3** Compute the energy for the characters in the text and energy per character of the CT signal.

**Note:** A text string will be given by the Course Leader.

### B.2

(10 Marks)

A data signal  $x(t)$  measured by a sensor attached to a source in an IoT application is transmitted to the destination (sink) node using two wireless links in series. Each of the links can be modelled as Linear Time Invariant (LTI) system with impulse responses  $h_1(t)$  and  $h_2(t)$ , respectively. The student needs to perform the following for the given  $x(t)$ ,  $h_1(t)$  and  $h_2(t)$ :

**B.2.1** Compute and plot the signal received by the second link.

**B.2.2** Compute and plot the signal received at the destination.

**B.2.3** Obtain the formula for the overall impulse response of the network.

**Note:** Consult the Course Leader for the relevant data.