

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

Assignment – 02			
Reg.No.		Name of Student	

Sections	Marking Scheme		Marks		
			Max Marks	First Examiner Marks	Moderator
Part A					
	A 1	Essay on DCT for Audio Signal Processing	5		
		Part-A Max Marks	5		
Part B					
	B 1.1	Formulation and solution of the difference equation	6		
	B 1.2	Plotting of traffic	2		
	B 1.3	Comments on the variability of the traffic	2		
		B.1 Max Marks	10		
	B 2.1	Computation of Laplace Transforms $W(s), H(s)$ and $Y(s)$	2		
	B 2.2	Computation of the response when only secret signal is sent	2		
	B 2.3	Recovery of the message signal	3		
	B 2.4	Modification for the case with convolved inputs	3		
		B.2 Max Marks	10		
Total Assignment Marks		25			

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 - 02
Term - 2

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)

Discrete Fourier Transform (DFT) is an essential theoretical and practical technique in signals and systems. Discrete Cosine Transform (DCT) is a special form of DFT employed for analysis and compression of audio and video signals.

In this context, write an essay on the topic: “**Discrete Cosine Transform for Audio Signal Processing**”

Part B

(20 Marks)

B.1

(10 Marks)

A Difference Equation model for the traffic (average number of queries per hour) is being developed to tune the performance of a database server. It is identified that the traffic during the current hour depends on the traffic during past two hours and on external factors. The external factors are found to be of the form $A \cos(\Omega n)$. Using the given traffic data and model parameter values, the student has to perform the following:

B.4.1 Formulate and solve the Difference Equation using the given data.

B.4.2 Plot the traffic as a function of $n = 0, 1, \dots, 50$.

B.4.3 Comment on the variability of the traffic using the solution.

Note: Consult the course leader for the relevant data.

B.2

(10 Marks)

A data security system uses digital watermarking by adding the message signal $m(t)$ with a secret (watermark) signal $w(t)$ to form the signal $s(t) = m(t) + w(t)$ transmitted to the receiver. The received signal is denoted by $y(t)$. The secret signal is known only to the sender and receiver. The transmission channel is assumed to be a Linear Time Invariant (LTI) system with an Impulse Response $h(t)$. Based on the $w(t)$, $y(t)$ and $h(t)$ given, the student has to perform the following:

B.2.1 Compute the Laplace Transforms $W(s)$, $H(s)$ and $Y(s)$

B.2.2 Compute the response $V(s)$ of the system when only $w(t)$ is transmitted over $h(t)$

B.2.3 Recover the message signal $m(t)$ from $Y(s)$

B.2.4 Analyse the effect of change in operation between the message and the watermark on the response ($w(t)$ and $m(t)$ are *convolved* instead of being added).

Note: Consult the course leader for the relevant data.