MALINENI LAKSHMAIAH WOMEN'S ENGINEERING COLLEGE

(Approved by AICTE, New Delhi & Affiliated to JNTUK, Kakinada)

(An ISO9001:2008 Certified Institution)

Pulladigunta (Vil), Vatticherukuru (Md), Prathipadu Road, Guntur – 522 017 A.P.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE FILE 2023-2024

NAME OF THE FACULTY: **SK.Gousiya Begum**

SUBJECT&COURSE CODE: **Signals & Systems (C204)**

YEAR &SEMESTER: **B.Tech (ECE) II Year & I Semester (2023-24)**

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WOMEN'S ENGINEERING COLLEGE
...GUNTA, GUNTUR-522017.

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Pulladigunta (V) Vatticherukuru (M), Guntur (Dist.)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

List of contents in the Course File

Department Vision /Mission/PO's/PSO's common to all course files

Sl. No		Description		Available /Not Available
0			Cover Page	
1	A	I.	Contents of Course File	
2	B	I.	Syllabus with Prescribed text books	
3		II.	Course Objectives and Outcomes	
4		III.	CO-PO and PSO mapping with justification	
5		IV.	Gap Identification and Contents Beyond Syllabus with mapping	
6	C	I.	Academic Calendar	
7		II.	Teaching/Instructional Plan	
8		III.	Instructional Methodology – Pedagogical initiatives and Innovation	
9		IV.	Assessment of Attainment of COs Plan – Direct and Indirect	
10		V.	University Results for Previous years and Current Attainment Target	
11		VI.	Individual Time Table	
12	D	I.	Course Materials/Notes – Unit wise	
13	E	I.	Previous Question papers – Internal and External	
14		II.	Question Bank – Unit wise	
15		III.	Assignment and Tutorial Questions with Solutions	
16		IV.	Internal Examination – Question Papers with Key and Scheme of Evaluation	
17	F	I.	Attendance Record	
18	G	II.	List of Slow Learners in the course	
19		III.	List of Advanced Learners and Programs conducted	
20		IV.	Remedial Classes to the Slow Learners	
21		V.	Remedial Classes Attendance Report	
22		VI.	Syllabus Coverage – Prescribed and Actual	
23		VII.	Make Up classes - Schedule	
24	H	I.	Evaluation Record – Internal, Quiz and Assignments	
25		II.	Sample Internal Answer Scripts and Assignments	
26	I	I.	Attainment Record – Direct and Indirect	
27		II.	Attainment Analysis – Corrective Action/Remedial Measures	
28	J	I.	University Results – Regular, Revaluation, Supplementary (1^{st})	
29	K	I.	Course Closure Report – Suggestion for Continuous Improvement	
30		II.	Remedial Classes for Backlog Students of this course	

Course Coordinator (s):

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Head of the Department

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year-I Semester		L	T	P	C
		3	1	0	3
SIGNALS AND SYSTEMS					

CourseObjectives:

Themain objectives of thiscoursearegiven below:

- Tostudyabout signalsand systems.
- ToanalyzethespectralcharacteristicsofsignalusingFourierseriesandFouriertransforms.
- Tounderstandthecharacteristicsofsystems.
- Tointroducetheconceptofsampling process
- Toknowvarious transformtechniquestoanalyzethesignals andsystems.

UNIT- I: INTRODUCTION: Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and ramp function. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonalfunctions, Mean square error, closed or complete set of orthogonal functions, Orthogonality incomplex functions. Related problems.

UNIT–II: FOURIER SERIES AND FOURIER TRANSFORM:

Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Relationbetween Trigonometric and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform, Related problems.

UNIT-III: ANALYSIS OF LINEAR SYSTEMS: Introduction, Linear system, impulseresponse, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV)system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTIsystem, Related problems. Filter characteristics of linear systems. Distortion less transmission through asystem, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidthand risetime.

UNIT–IV:

CORRELATION: Auto-correlation and cross-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between Convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction ofsignal from noise by filtering.

SAMPLINGTHEOREM: Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling –Aliasing, Introduction to Band Pass sampling, Relatedproblems.

UNIT–V:

LAPLACE TRANSFORMS: Introduction, Concept of region of convergence (ROC) forLaplace transforms, constraints on ROC for various classes of signals, Properties of L.T's,Inverse Laplace transform, Relation betweenL.T's, and F.T. of a signal. Laplace transformofcertain signals usingwaveform synthesis.

Z–TRANSFORMS: Concept of Z-Transform of a discrete sequence. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms. Distinction between Laplace, Fourierand Z transforms.

TEXTBOOKS:

1. Signals, Systems&Communications-B.P.Lathi, BS Publications, 2003.
2. Signals and Systems-A.V. Oppenheim, A.S. Willsky and S.H. Nawab,PHI, 2ndEdn, 1997
3. Signals & Systems-Simon Haykinand Van Veen, Wiley, 2ndEdition, 2007

REFERENCEBOOKS:

1. PrinciplesofLinearSystemsandSignals–BPLathi,OxfordUniversityPress,2015
2. SignalsandSystems–TK Rawat,Oxford University press,2011

CourseOutcomes: At the end of this course the student will able to:

- Differentiate the various classifications of signals and systems
- Analyze the frequency domain representation of signals using Fourier concepts
- Classify the systems based on their properties and determine the response ofLTISystems.
- Know the sampling process and various types of sampling techniques.
- Apply Laplace and z-transforms to analyze signals and Systems (continuous&discrete).

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Directorate of Academic Planning

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA-533003, Andhra Pradesh, INDIA
(Established by AP Government Act No. 30 of 2008)

Lr. No. DAP/AC/II Year /B. Tech 2023 *Date 07.08.2023*

Dr. KVSG Murali Krishna,
M.E. Ph.D.
Director, Academics & Planning
JNTUK, Kakinada

To
All the Principals of Affiliated Colleges,
JNTUK, Kakinada.

Academic Calendar for II Year - B. Tech for the AY 2023-24

I SEMESTER			
Description	From	To	Weeks
Commencement of Class Work	**07.08.2023**		
I Unit of Instruction	07.08.2023	30.09.2023	8W
I Mid Examinations	25.09.2023	30.09.2023	
II Unit of Instructions	02.10.2023	25.11.2023	8W
II Mid Examinations	20.11.2023	25.11.2023	
Preparation & Practicals	27.11.2023	09.12.2023	2W
End Examinations	11.12.2023	23.12.2023	2W
Commencement of II Semester Class Work	**27.12.2023**		
II SEMESTER			
I Unit of Instructions	**27.12.2023**	17.02.2024	8W
I Mid Examinations	12.02.2024	17.02.2024	
II Unit of Instructions	19.02.2024	13.04.2024	8W
II Mid Examinations	08.04.2024	13.04.2024	
Preparation & Practicals	15.04.2024	27.04.2024	2W
End Examinations	29.04.2024	11.05.2024	2W
Summer Internship	13.05.2024	06.07.2024	8W
Commencement of III- I Class Work	08.07.2024		

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Academic Planning
JNTUK, Kakinada

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Academics & Planning,
JNTUK

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Copy to Registrar, JNTUK
Copy to Director Academic Audit, JNTUK
Copy to Director of Evaluation, JNTUK

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

LESSON PLAN

Course Name : SIGNALS & SYSTEMS
Academic Year : 2023-24 I Semester
Degree & Branch : II B.Tech ECE

S.No	Topic	Teaching Aid	Books
	UNIT-I INTRODUCTION		
1	Definition of Signals and Systems	Teacher Centered	T1
2	Classification of Signals and Systems	Teacher Centered	T1, W1
3	Operations on signals	Teacher Centered	T2
4	Complex exponential and sinusoidal signals	Teacher Centered	T3
5	Singularity functions and related functions	Teacher Centered	R1, W1
6	Analogy between vectors and signals	Teacher Centered	T2
7	Introduction to Orthogonal signal space & Mean square error	Teacher Centered	R2, T2
8	Signal approximation using orthogonal functions	Teacher Centered	R4, T3
9	Concept of Closed or complete set of orthogonal functions	Teacher Centered	T2
10	Introduction to Orthogonality in complex functions	Teacher Centered	T3, T1
	UNIT-II FOURIER SERIES & FOURIER TRANSFORM		
11	Fourier series representation of continuous time periodic signals	Teacher Centered	T2, W4
12	Properties of Fourier series	Teacher Centered	T1
13	Dirichlet's conditions	Teacher Centered	R5, T3
14	Trigonometric Fourier series and Exponential Fourier series	Teacher Centered	T2, W3
15	Introduction to Discreate Time Fourier Series	Teacher Centered	T1, W1
16	Introduction to Complex Fourier spectrum	Teacher Centered	T3, W3
17	Deriving Fourier transform from Fourier series	Teacher Centered	T2
18	Fourier transform of arbitrary signal	Teacher Centered	T2, T3
19	Fourier transform of standard signals	Teacher Centered	R2, T1
20	Fourier transform of periodic signals	Teacher Centered	R3, T2

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21	Properties of Fourier transforms	Teacher Centered	T1
22	Fourier transforms involving impulse and Signum function	Teacher Centered	R5, T1
23	Introduction to Discreate Time Fouries Transform	Teacher Centered	T1, W1
24	Introduction to Hilbert Transform.	Teacher Centered	T2
UNIT-III ANALYSIS OF LINEAR SYSTEMS			
25	Linear system, impulse response	Teacher Centered	R4, T1
26	Response of a linear System, LTI & LTV system	Teacher Centered	T2
27	Concept of convolution, Transfer function of a LTI system	Teacher Centered	T2, W2
28	Filter characteristics of linear systems	Teacher Centered	T1
29	Distortion less transmission through a system	Teacher Centered	R2, T2
30	Signal bandwidth, system bandwidth	Teacher Centered	T2
31	Ideal LPF, HPF and BPF characteristics	Teacher Centered	T1, T3
32	Causality and Poly-Wiener criterion for physical realization	Teacher Centered	T2
33	Relationship between bandwidth and rise time	Teacher Centered	T3
UNIT IV CORRELATION & SAMPLING THEOREM			
34	CCF & ACF, Properties of correlation function	Teacher Centered	R2, T2
35	Energy density spectrum, Parseval's theorem	Teacher Centered	T2
36	PDS, Relation between ACF & PDS	Teacher Centered	R2, T1
37	Relation between convolution and correlation	Teacher Centered	T2
38	Detection of periodic signals in the presence of noise by correlation	Teacher Centered	T2, T3
39	Extraction of signal from noise by filtering	Teacher Centered	T1
40	Introduction to sampling	Teacher Centered	T2
41	Graphical and analytical proof for Band Limited Signals	Teacher Centered	R4, T1
42	Impulse sampling, Natural and Flat top Sampling	Seminar	T1, W1
43	Reconstruction of signal from its samples	Teacher Centered	T2, T3
44	Effect of under sampling – Aliasing	Teacher Centered	T3
45	Introduction to Band Pass sampling	Teacher Centered	R3, T2

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UNIT –V: LAPLACE TRANSFORMS & Z–TRANSFORMS			
46	Review of Laplace transforms	Teacher Centered	T2, W2
47	Introduction to Partial fraction expansion	Teacher Centered	T2
48	Introduction to Inverse Laplace transform	Teacher Centered	T3
49	Concept of ROC	Teacher Centered	T1, T3
50	Constraints on ROC	Teacher Centered	T1
51	Properties of L.T's	Flipped Classroom	T3
52	Relation between L.T's, and F.T.	Teacher Centered	R2, T2
53	Laplace transform of certain signals using waveform synthesis	Teacher Centered	R3, T1
54	Problems on Laplace transforms	Teacher Centered	T1
55	Laplace Transform and Inverse Laplace Transform	Quiz	T2, T3
56	Fundamental difference between continuous-time & discrete-time signals	Teacher Centered	T1
57	Discrete signal representation using complex exponential & sinusoidal components	Teacher Centered	T2, T3
58	Periodicity of discrete time using complex exponential signal	Teacher Centered	T1
59	Concept of Z- Transform of a discrete sequence	Teacher Centered	R3, W2
60	Distinction between Laplace, Fourier and Z transforms	Student Centered	T2,A1
61	Region of convergence in Z-Transform & Constraints on ROC for various classes of signals	Teacher Centered	T3, W4
62	Introduction to Inverse Z-transform,	Teacher Centered	T1, T3
63	Properties of Z-transforms	Cooperative Learning	R2, T2
64	Problems	Cooperative Learning	R2, T2

TEXT BOOKS:

T1. Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.
T2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn.
T3. Signals & Systems- Narayan Iyer and K Satya Prasad, Cenage Pub.

REFERENCE BOOKS:

R1. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition.
R2. Principles of Linear Systems and Signals – BP Lathi, Oxford University Press, 2015

R3. Signals and Systems – K Raja Rajeswari, B VisweswaraRao, PHI, 2009
R4. Fundamentals of Signals and Systems- Michel J. Robert, MGH International Edition, 2008.
R5. Signals and Systems – T K Rawat , Oxford University press, 2011

ADDITIONAL BOOK:

A1. Signals & Systems - A.P.Godse and D.A.Godse, Technical Publications, 2nd Edition.

WEB REFERENCES:

W1. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/lecture-notes/
W2. https://www.dspguide.com/ch6/2.htm
W3. https://www.khanacademy.org/science/electrical-engineering/ee-signals
W4. https://nptel.ac.in/courses/117104074/26

Faculty Incharge

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

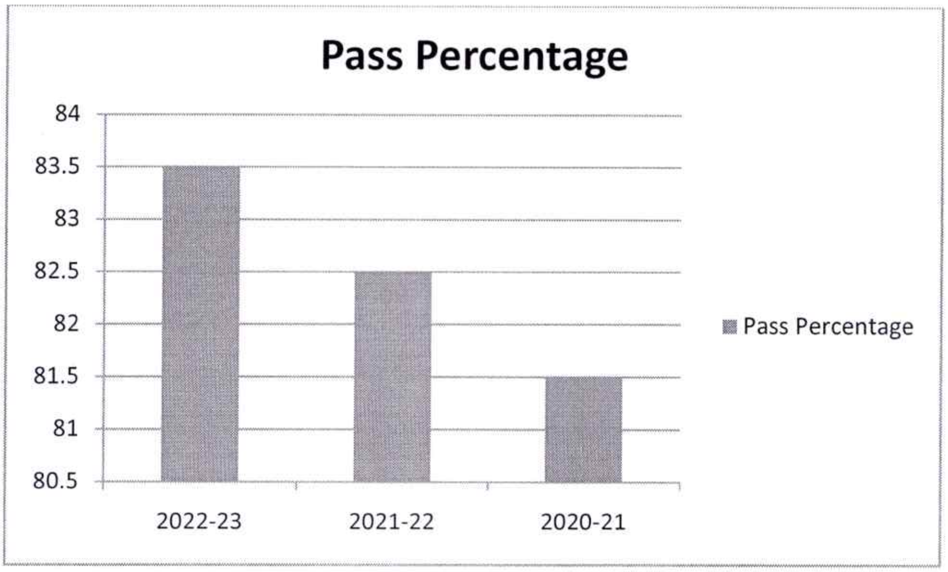
A.Y.: 2023-24 Date: 7/8/2023

Subject Code	C204
Subject Name	SIGNALS & SYSTEMS
Regulation	R20
Year & Semester	II & I
Academic Year	2023-24

UNIVERSITY RESULTS FOR BOTH PREVIOUS AND CURRENT YEAR

RESULTANALYSIS-PREVIOUS YEARS

Academic Year	Year of Study	Semester	Pass Percentage
2022-23	II	I	83.5
2021-22	II	I	82.5
2020-21	II	I	81.5



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CLASS TIME TABLE MLEW/ECE/TIMETABLES/23-24/CT/02

Class: II-B.Tech ECE **Semester: I** **Section: A** **LH. NO.** **W.E.F. : 07-08-2023**

Period/ Day	1	2	10:40 – 10:50	3	4	12:30 - 1:20	5	6	7
	9:00-09:50	09:50-10:40		10:50 – 11:40	11:40-12:30		01:20-02:10	02:10-03:00	03:00-03:50
Monday	S&S								
Tuesday				S&S					
Wednesday	S&S					**LUNCH BREAK**			
Thursday		S&S							
Friday				S&S					
Saturday	S&S								

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Class In-Charge **Time Table Coordinator** **Head of the Department**

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CLASS TIME TABLE

MLEW/ECE/TIMETABLES/23-24/CT/02

Class: II-B.Tech ECE **Semester: I** **Section: B** **LH. NO.** **W.E.F. : 07-08-2023**

Period/ Day	1	2	10:40 – 10:50	3	4	12:30 - 1:20	5	6	7
	9:00-09:50	09:50-10:40		10:50 – 11:40	11:40-12:30		01:20-02:10	02:10-03:00	03:00-03:50
Monday		S&S				LUNCH BREAK			
Tuesday	S&S								
Wednesday				S&S					
Thursday							S&S		
Friday		S&S							
Saturday		S&S							

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Class In-Charge

Time Table Coordinator

Head of the Department

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

QUESTION BANK

Date:10/8/23

Subject Name : SIGNALS & SYSTEMS
Year / Semester : II-A / I
Degree / Branch : B.Tech / ECE
Academic Year : 2023 - 2024

UNIT - 1

1. Define a signal? Give various classifications of signals and explain each classification.
2. Find the power and rms value of signal x(t)=20Cos(2πt).
3. Distinguish between i) Linear and non linear systems ii) Time variant and Time invariant systems iii) Stable and Unstable systems.
4. Determine whether the following discrete -time signals are periodic or not? (i) Sin (0.002πn) (ii) cos 4n
5. Determine whether the following signals are energy or power signals. (i) x(t) = sin2 ω0t (ii) x(t) = t u(t)
6. Distinguish between Causal and Non-casual systems with an example.
7. Explain about time shifting and scaling properties with an example.
8. Discuss briefly Orthogonality in complex functions.
9. Define and sketch the following signals: i) Signum Function ii) Impulse function iii) Unit step function.
10. Distinguish between the following: i) Continuous time signal and discrete time signal. ii) Unit step and Unit Ramp functions. iii) Periodic and Aperiodic Signals.
11. Determine whether the following function is periodic or not. If so find the period. x(t)=3sin 200πt + 4cos 100t.
12. Define the error function while approximating signals and hence derive the expression for condition for orthogonality between two waveforms f1(t) and f2(t).

UNIT - 2

1. State and prove the time-convolution property of Fourier transform.
2. State and Prove Convolution property and Parseval's relation of Fourier series.
3. What is the difference between Fourier series Analysis and Fourier Transforms? Explain with an example.
4. What is the significance of Hilbert Transform? Give the mathematical analysis.
5. Prove any two properties of Fourier transforms.
6. Find the Fourier transform of signum function.
7. Explain how the Fourier transform of a periodic signal can be obtained.
8. Find the Hilbert transform of the signal x(t)= cos (2πt).
9. State and prove the time-scaling property of Fourier transform.
10. Find the Fourier Transform of f (t) = t cos (2t) using properties.
11. Find the trigonometric Fourier series expansion of a Half wave rectified cosine function with fundamental time period of 2π.

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12. Explain Dirchlet's conditions and its significance to obtain Fourier series representation of any signal.

UNIT - 3

1. Explain the filter characteristics of ideal LPF, HPF and BPF using their magnitude and phase responses.
2. Obtain the impulse response of an LTI system defined by dy(t)/dt + 2y(t) = x(t). Also obtain the response of this system when excited by e–2tu(t).
3. Explain the characteristics of ideal LPF and HPF.
4. Obtain the conditions for distortion less transmission through a system.
5. Discuss the concept of convolution in time domain and frequency domain.
6. Write about filter characteristics of linear systems.
7. Find the convolution of two signals x(t)= u(t-1) – u(t+1) and h(t) = e-at u(t), a>0.
8. Discuss the Causality and Poly-Wiener criterion for physical realization.
9. Derive the relationship between bandwidth and rise time.
10. Enlist the differences between LPF & HPF.
11. What is Impulse Response? Show that the response of an LTI system is convolution integral of its impulse Response with input signal?
12. Discuss the Graphical representation of convolution with an example.

UNIT – 4

1. A signal x(t)= 2 cos 400πt + 6 cos 640πt is ideally sampled at fs = 500 Hz. If the sampled signal is passed through an ideal low pass filter with a cut off frequency of 400 Hz, what frequency components will appear in the output?
2. What is the effect of under sampling? Discuss different types of samplings.
3. Explain about Cross-correlation & list its properties.
4. Determine the Nyquist rate for x(t) = 1+ cos 2000πt + sin 4000 πt.
5. Find the Nyquist rate and Nyquist interval for the signals (a) rect (300t) (b) 10 sin 40πt cos 300 πt
6. Explain the difference between Impulse, Natural and Top Sampling.
7. Define power density spectrum and its properties.
8. Interpret about the sampling of band pass signals.
9. Discuss about the extraction of signal from noise by filtering.
10. Explain about the graphical and analytical proof for Band Limited Signals.
11. Discuss briefly reconstruction of signal from its samples.
12. Obtain the relation between Convolution and correlation of the signals.

UNIT – 5

1. Find the Laplace transform of the following signals: (i) Impulse function, (ii) unit step function , iii) A Sin (w0t) u(t) iv) te-t u(t).
2. State the properties of ROC of Laplace Transform.

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3. State and prove the following properties of Z transform: (i) Time shifting, and (ii) Differentiation in z- domain
4. Distinguish between Fourier transform, Laplace transform and z transforms.
5. Explain the Time convolution and Scaling properties of Laplace transform.
6. State and prove initial-value theorem, final value theorem of Laplace transforms.
7. Find the inverse of Z transform of X (Z) = Z / ($3Z^2$ - 4Z+1).
8. Find the inverse z- transform of x(z) = z/ (z +2) (z-3) when the ROC is i) ROC: |z| < 2 ii) ROC: 2 < |z| < 3
9. State and prove time shifting and time convolution properties of z- transform.
10. Explain the concept of stability in S domain and What do you mean by region of convergence?
11. State and prove the Convolution Property of Z -Transform.
12. Determine z-transform, ROC and pole-zero locations of x[n] = e^{jwon} u[n], x(n) = -an u(-n-1)

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MALINENI LAKSHMAIAH WOMENS ENGINEERING COLLEGE (KE)

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PULLADIGUNTA, GUNTUR-522017

MLWEC

NBA granted for 3 years (2022-25) for CSE & ECE

NAAC A+

II B.TECH, I SEM I INTERNAL EXAMINATIOS, OCT: 2023(R20) **Branch: ECE**

COURSE:SIGNALS & SYSTEMS (UNIVERSITY CODE: 201201)

Max. Marks: 15 **Time**: 90 min **Date**: 6/10/2023

(COURSECODE:R2021043)

Answer all the questions REGD No:

Q.No.	QUESTIONS	CO	*RBTL*	*Marks*
1.a	Justify whether the following are Energy or Power signals. (i) $x(t) = e^{-at}u(t)$ (ii) $x[n] = 0.5^n u[n]$ (iii) $x(t) = sin^2\omega_o t.$ If power signals find *r.m.s.* value.	21043.1	L2	3
1.b	Analyze the analogy between vectors and signals for orthogonality.	21043.1	L1	2
2.a	Apply FS principle to obtain complex exponential FS coefficients of the signal $x(t) = sin3\pi t + 2\cos 4\pi t$	21043.2	L3	2
2.b	State and prove differentiation and integration properties of FT.	21043.2	L2	3
3	Discuss the concept of convolution in time domain and frequency domain.	21043.3	L3	5

***Level 1 (Analyze)** ***Level 2 (Apply)** ***Level 3 (Evaluate)**

MALINENI LAKSHMAIAH WOMENS ENGINEERING COLLEGE (KE)

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PULLADIGUNTA, GUNTUR-522017

MLWEC

NBA granted for 3 years (2022-25) for CSE & ECE

NAAC A+

II B.TECH, I SEM I INTERNAL EXAMINATIOS, OCT: 2023(R20) **Branch: ECE**

COURSE:SIGNALS & SYSTEMS (UNIVERSITY CODE: 201201)

Max. Marks: 15 **Time**: 90 min **Date**: 6/10/2023

(COURSECODE:R2021043)

Answer all the questions REGD No:

Q.No.	QUESTIONS	CO	*RBTL*	*Marks*
1.a	Justify whether the following are Energy or Power signals. (i) $x(t) = e^{-at}u(t)$ (ii) $x[n] = 0.5^n u[n]$ (iii) $x(t) = sin^2\omega_o t.$ If power signals find *r.m.s.* value.	21043.1	L2	3
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3	Discuss the concept of convolution in time domain and frequency domain.	21043.3	L3	5

***Level 1 (Analyze)** ***Level 2 (Apply)** ***Level 3 (Evaluate)**

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15/15

Name of the Student : Ch. Alekhya Regd. No 23KESA0403 Branch ECE

B.Tech / M.Tech / MBA Year : II Sem : I Subject : S&S Sign of the Invigilator :

Date 06/10/2023

1a - 3 2a - 2 3 - 5

1b - 2 2b - 3 Total : 15/15

1a) i) $x(t) = e^{-at}u(t)$

1a	3
1b	2
2a	2
2b	3
3	5
	15

we know that

Total energy $E = \int_0^\infty |x(t)|^2 dt$

$= \int_0^\infty |e^{-at}|^2 dt$

$= \int_0^\infty e^{-2at} dt \quad \left[\because \int e^{at} dt = \frac{e^{at}}{a}\right]$

$= \left[\frac{e^{-2at}}{-2a}\right]_0^\infty$

$= \frac{e^{-2a(\infty)}}{-2a} - \frac{e^{-2a(0)}}{-2a}$

$= \frac{1}{-2a}\left[e^{-2a(\infty)} - e^{-2a(0)}\right]$

$= \frac{1}{-2a}[0-1]$

$E = \frac{1}{2a}$ J

Average power $= \lim_{T\to\infty} \frac{1}{2T}\int_{-T}^{T} |x(t)|^2 dt$

$$= \underset{T \to \infty}{Lt} \frac{1}{2T} \int_0^t \frac{1}{2a} dt$$

$$= \underset{T \to \infty}{Lt} \frac{1}{2T} \cdot \frac{1}{2a} [t - 0]$$

$$= \frac{1}{2(\infty)} \cdot \frac{1}{2a} (t)$$

$$\boxed{P = 0W}$$

∴ If Energy is finite then the power is zero. so it is an energy signal

E = finite, P = 0

ii) $x(n) = 0.5^n u(n)$

we know that

Total energy $E = \underset{N \to \infty}{Lt} \sum_{n=-N}^{N} |x(n)|^2$

$$= \underset{N \to \infty}{Lt} \sum_{n=0}^{\infty} |0.5^n|^2$$

$$= \underset{N \to \infty}{Lt} \sum_{n=0}^{\infty} \left[\left(\frac{1}{2}\right)^n\right]^2$$

In GP

$$= \underset{N \to \infty}{Lt} \sum_{n=0}^{\infty} \left[\left(\frac{1}{4}\right)^n\right] \quad \left[\because \Sigma(a^n) = \frac{1}{1-a}\right]$$

$$= \underset{N \to \infty}{Lt} \frac{1}{1 - \frac{1}{4}}$$

$$= \frac{1}{\frac{3}{4}} = \frac{4}{3} J$$

$$\boxed{E = \frac{4}{3} J}$$

Average power $P = \underset{N\to\infty}{Lt} \frac{1}{2N+1} \sum_{n=-N}^{N} |x(n)|^2$

$= \underset{N\to\infty}{Lt} \frac{1}{2N+1} \sum_{n=-N}^{N} \left[\frac{4}{3}\right]^{2n}$

$\boxed{P = 0W}$

If energy is finite then the power is 0

Hence, it is an energy signal

iii) $x(t) = \sin^2 \omega_0 t$

we know that

Total energy $E = \int_0^\infty |\sin^2 \omega_0 t|^2 dt$

$= \int_0^\infty \sin^4 \omega_0 t \, dt$

$= \int_0^\infty \frac{1}{8}[3 - 4\cos 2\omega_0 t + \cos 4\omega_0 t]$

$= \frac{3}{8} \int_0^\infty [-4\cos 2\omega_0 t + \cos 4\omega_0 t] dt$

$= \frac{3}{8} \left[\frac{\sin 2\omega_0 t}{2\omega_0} + \frac{\sin 4\omega_0 t}{4\omega_0}\right]_0^\infty$

$= \frac{3}{8} \left[\frac{\sin 2\omega_0(\infty)}{2\omega_0} - \frac{\sin 2\omega_0(0)}{2\omega_0} + \frac{\sin 4\omega_0(\infty)}{4\omega_0} - \frac{\sin 4\omega_0(0)}{4\omega_0}\right]$

$= \frac{3}{8}[\infty - 0 + \infty - 0]$

$= \frac{3}{8}\infty = \infty$ $\boxed{E = \infty}$

$$\boxed{E = \infty}$$

Average power $P = \lim_{T\to\infty} \frac{1}{2T}\int_{-T}^{T} |x(t)|^2 dt$

$$= \lim_{T\to\infty} \frac{1}{2T}\int_{0}^{t} \sin^4 \omega_0 t\, dt$$

$$= \lim_{T\to\infty} \frac{1}{2T}\int_{0}^{t} \frac{1}{8}\left[3 - 4\cos 2\omega_0 t + \cos 4\omega_0 t\right]$$

$$= \frac{1}{2\infty} \frac{3}{8}\left[\frac{\sin 2\omega_0 t}{2\omega_0} + \frac{\sin 4\omega_0 t}{4\omega_0}\right]_0^t$$

$$= \frac{1}{2\infty} \frac{3}{8}\left[\frac{\sin 2\omega_0 t}{2\omega_0} - \frac{\sin 2\omega_0(0)}{2\omega_0} + \frac{\sin 4\omega_0 t}{4\omega_0} - \frac{\sin 4\omega_0(0)}{4\omega_0}\right]$$

$$= \frac{3}{8}\left[\frac{\sin 2\omega_0 t}{2\omega_0} + \frac{\sin 4\omega_0 t}{4\omega_0}\right]$$

$$\boxed{P = \frac{3}{8}\omega}$$

Energy is infinite then the power is finite

Hence it is an power signal

$$\text{RMS value} = \sqrt{P} = \sqrt{\frac{3}{8}}$$

$$\boxed{\text{RMS} = \sqrt{\frac{3}{8}}}$$

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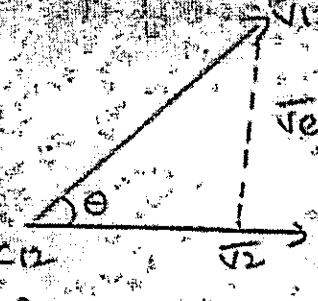
Regd. No. 23KE5A0403 Sign of the Invigilator

1b) Analogy between vectors and signals for orthogonality

Vectors:



$\overline{V_e} = \overline{V_1} - c_{12}\overline{V_2}$ $\overline{V_e}$ = error vector

$\overline{V_1}$ in terms of $\overline{V_2}$

$\overline{V_1} = c_{12}\overline{V_2}$

$\overline{V_1}$ & $\overline{V_2}$ → vector (Amplitude)

V_1 → scalar

$\overline{V_1} \cdot \overline{V_2} = V_1 \cdot V_2 \cos\theta$

at $\theta = 90°$

$\overline{V_1} \cdot \overline{V_2} = V_1 \cdot V_2 \cos 90°$ [$\because \cos 90° = 0$]

$\boxed{\overline{V_1} \cdot \overline{V_2} = 0}$

This is called orthogonality in vector

signals

$x_1(t), x_2(t)$

$x_1(t) = c_{12} x_2(t)$

$x_e(t) = x_1(t) - c_{12} x_2(t)$

Error = $x_1(t) - c_{12} x_2(t)$

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To minimize the error over time interval (t_1, t_2) calculate the average error value

$$\text{Error} = x_1(t) - c_{12}x_2(t)$$

$$\frac{1}{t_1 - t_2}\int_{t_1}^{t_2} x_e(t)\,dt = \frac{1}{t_1 - t_2}\int_{t_1}^{t_2} x_1(t) - c_{12}x_2(t)\,dt$$

$$E = \frac{1}{t_1 - t_2}\int_{t_1}^{t_2}\left[x_1(t) - c_{12}x_2(t)\right]^2 dt$$

$$\frac{d}{dc_{12}} E = 0$$

$$\frac{d}{dc_{12}^2} E^2 = 0$$

$$\frac{d}{dc_{12}}\,\frac{1}{t_1 - t_2}\int_{t_1}^{t_2}\left[x_1(t) - c_{12}x_2(t)\right]^2 dt = 0$$

$$\frac{1}{t_1 - t_2}\,\frac{d}{dc_{12}}\int_{t_1}^{t_2}\left[x_1^2(t) + c_{12}^2x_2^2(t) - 2x_1(t)x_2(t)c_{12}\right]dt = 0$$

$$\int_{t_1}^{t_2}\frac{d}{dc_{12}}x_1^2(t)\,dt + \int_{t_1}^{t_2}\frac{d}{dc_{12}}c_{12}^2x_2^2(t) - \int_{t_1}^{t_2}2x_1(t)x_2(t)c_{12}\,dt = 0\,(t_2 - t_1)$$

$$\int_{t_1}^{t_2} 0\,dt + \int_{t_1}^{t_2} 2c_{12}x_2^2(t) - \int_{t_1}^{t_2} 2x_1(t)x_2(t) = 0$$

$$\int_{t_1}^{t_2} 2c_{12}x_2^2(t) - \int_{t_1}^{t_2} 2x_1(t)x_2(t) = 0$$

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Regd. No. 23LF5A0403 Sign of the Invigilator

$$\int_{t_1}^{t_2} C_{12} x_2^2(t) = \int_{t_1}^{t_2} x_1(t) x_2(t)$$

$$C_{12} = \frac{\int_{t_1}^{t_2} x_1(t) x_2(t)}{\int_{t_1}^{t_2} x_2^2(t)}$$

vectors

~~$C_{12} = \frac{V_1 \cdot V_2}{V_2^2}$~~

2a) $x(t) = \sin 3\pi t + 2\cos 4\pi t$

we know that

$$x(t) = \sum_{n=-\infty}^{\infty} c_n e^{jn\omega_0}$$

complex exponential F.S are

$$--- + C_{-3} e^{j-3\omega_0} + C_{-2} e^{j-2\omega_0} + C_{-1} e^{j-1\omega_0} + C_0 + C_1 e^{j\omega_0} + C_2 e^{j2\omega_0} + C_3 e^{j3\omega_0} + ---$$

Given

$x(t) = \sin 3\pi t + 2\cos 4\pi t$

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$= \sin 3\pi t + 2\cos 4\pi t$

$\sin\theta = \frac{e^{j\theta} - e^{-j\theta}}{2j}$

$\cos\theta = \frac{e^{j\theta} + e^{-j\theta}}{2}$

$= \sin$

$= \frac{e^{3j\pi\omega_0} - e^{-3j\pi\omega_0}}{2j} + 2\left[\frac{e^{4j\pi\omega_0} + e^{-4j\pi\omega_0}}{2}\right]$

$= \frac{e^{3j\pi\omega_0}}{2j} - \frac{e^{-3j\pi\omega_0}}{2j} + e^{4j\pi\omega_0} + e^{-4j\pi\omega_0}$

$= \frac{e^{3j\pi\omega_0}}{2} - \frac{e^{-3\pi\omega_0}}{2} + e^{4\pi\omega_0} + e^{-4\pi\omega_0}$ —— ①

compare eq ① with complex exponential FS then

$= \frac{e^{3\pi\omega_0}}{2} - \frac{e^{-3\pi\omega_0}}{2} + e^{4\pi\omega_0} + e^{-4\pi\omega_0}$

$C_3 \quad C_{-3} \quad C_4 \quad C_{-4}$

$C_3 = \frac{1}{2}$

$C_{-3} = \frac{-1}{2}$

$C_4 = 1$

$C_{-4} = 1$

2b) Differentiation of FT of time domain

The differentiation of fourier transform is equivalent to the multiplication of fourier transform

If $x(t) \xleftrightarrow{FT} X(\omega)$

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then $\frac{d}{dt}x(t) \xleftrightarrow{FT} j\omega X(\omega)$

Proof:

$$x(t) = \frac{1}{2\pi}\int_{-\infty}^{\infty} x(\omega) e^{j\omega t} d\omega$$

Apply differentiation on both sides w.r.t 't'

$$\frac{d}{dt}x(t) = \frac{d}{dt}\frac{1}{2\pi}\int_{-\infty}^{\infty} x(\omega) e^{j\omega t} d\omega$$

$$\frac{d}{dt}x(t) = \frac{d}{dt}\frac{1}{2\pi}x(\omega)\int_{-\infty}^{\infty} e^{j\omega t} d\omega$$

$$\frac{d}{dt}x(t) = \frac{d}{dt}\frac{1}{2\pi}x(\omega)\left[\frac{e^{j\omega t}}{jt}\right]_{-\infty}^{\infty}$$

$$\frac{d}{dt}x(t) = \frac{d}{dt}\frac{1}{2\pi}x(\omega)\left[\frac{e^{jt(\infty)} - e^{jt(-\infty)}}{jt}\right]$$

$$\frac{d}{dt}x(t) = \frac{d}{dt}\frac{1}{2\pi}x(\omega)\left[\frac{\infty - 0}{jt}\right]$$

$$x(t) = \frac{1}{2\pi}\int_{-\infty}^{\infty} x(\omega) e^{j\omega t} d\omega$$

Hence proved

Differentiation of FT of Frequency Domain

If $x(t) \xleftrightarrow{FT} x(\omega)$

then $t\,x(t) \xleftrightarrow{FT} j\frac{d}{d\omega}X(\omega)$

Proof:

$$X(\omega) = \int_{-\infty}^{\infty} x(t)\, e^{-j\omega t}\, dt$$

Apply differentiation on both sides wrt 't'

$$\frac{d}{dt}X(\omega) = \frac{d}{dt}\int_{-\infty}^{\infty} x(t)\, e^{-j\omega t}\, dt$$

$$\frac{d}{dt}X(\omega) = \frac{d}{dt}x(t)\int_{-\infty}^{\infty} e^{-j\omega t}\, dt$$

$$\frac{d}{dt}X(\omega) = \int_{-\infty}^{\infty} e^{-j\omega t}\, dt$$

$$\frac{d}{dt}X(\omega) = \left[\frac{e^{-j\omega t}}{-j\omega}\right]_{-\infty}^{\infty}$$

$$\frac{d}{dt}X(\omega) = \left[\frac{e^{-j\omega(\infty)}}{-j\omega} - \frac{e^{-j\omega(-\infty)}}{-j\omega}\right]$$

$$\frac{d}{dt}X(\omega) = \frac{1}{-j\omega}$$

$$X(\omega) = \int_{-\infty}^{\infty} x(t)\, e^{-j\omega t}\, dt$$

Hence proved

Integration of fourier transform

If $x(t) \xleftrightarrow{FT} X(\omega)$

then $\int_{-\infty}^{t} x(T)\, dT \xleftrightarrow{FT} \frac{1}{j\omega} x(j\omega)$ if $x(0)=0$

proof:

Integration of fourier transform is equivalent of division of fourier transform

$$x(T) = \frac{1}{2\pi}\int_{-\infty}^{\infty} x(T)\, e^{j\omega T} dT$$

Apply differentation on both sides

$$\frac{d}{dt}x(T) = \frac{d}{dt}\frac{1}{2\pi}\int_{-\infty}^{\infty} x(T) e^{j\omega T} dT$$

$$\frac{d}{dt}x(T) = \frac{d}{dt}\frac{1}{2\pi} x(T)\int_{-\infty}^{\infty} e^{j\omega T} dT$$

$$\frac{d}{dt}x(T) = \frac{d}{dt}\frac{1}{2\pi}x(T)\left[\frac{e^{j\omega T(\infty)}}{j\omega} - \frac{e^{j\omega T(-\infty)}}{j\omega}\right]$$

Hence proved.

3. convolution in time domain and frequency domain

Statement:

convolution of two signals of time domain is equivalent of spectra time frequency.

FT (Fourier transform)

$$x(\omega) = \int_{-\infty}^{\infty} x(t)\, e^{-j\omega t} dt$$

I.F.T (Inverse Fourier Transform)

$x($

$x(t) \cdot f \quad x(t) = \frac{1}{2\pi}\int_{-\infty}^{\infty} x(\omega) e^{j\omega t} d\omega$

LHS

$x(t) = x_1(t)\, x_2(t)$

$FT[x(t)] = \int_{-\infty}^{\infty} x_1(t)\, x_2(t)\, e^{-j\omega t} dt$

$IFT[x(t)] = \int_{-\infty}^{\infty} \frac{1}{2\pi}\int_{-\infty}^{\infty} x_1(\lambda) e^{j\lambda t} d\lambda\, x_2(t) e^{-j\omega t} dt$

$= \frac{1}{2\pi}\int_{-\infty}^{\infty} x_1(\lambda) e^{j\lambda t} d\lambda \int_{-\infty}^{\infty} x_2(t) e^{-j\omega t} dt$

$= \frac{1}{2\pi}\int_{-\infty}^{\infty} x_1(\lambda) d\lambda \int_{-\infty}^{\infty} x_2(t) e^{-j(\omega-\lambda)t} dt$

$= \frac{1}{2\pi}\int_{-\infty}^{\infty} x_1(\lambda)\, x_2(\omega-\lambda)\, d\lambda$

we know

$\int_{-\infty}^{\infty} x_1(\lambda)\, x_2(\omega-\lambda) = x_1(\omega) * x_2(\omega)$

$= \frac{1}{2\pi}\left(x_1(\omega) * x_2(\omega)\right)$

RHS

$x_1(t) * x_2(t) = \int_{-\infty}^{\infty} x_1(\tau)\, x_2(t-\tau)\, d\tau$

$FT[x_1(t)\, x_2(t)] = \int_{-\infty}^{\infty}\int_{-\infty}^{\infty} x_1(\tau)\, x_2(t-\tau)\, d\tau\, dt\, e^{-j\omega t}\, d\tau\, dt$

$$= \int_{-\infty}^{\infty} x_1(\tau)d\tau \int_{-\infty}^{\infty} x_2(t-\tau) e^{-j\omega t} dt$$

$$t - \tau = P$$

$$dt = dP$$

$$t = P + \tau$$

$$= \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} x_1(\tau)\, x_2(P)\, e^{-j\omega(P+\tau)} d\tau\, dt$$

$$= \int_{-\infty}^{\infty} x_1(\tau) e^{-j\omega\tau} d\tau + x_2(P) e^{-j\omega P} dp$$

$$= [x_1(\omega) * x_2(\omega)]$$

$$[x_1(t)\, x_2(t)] = [x_1(\omega) * x_2(\omega)]$$

LHS = RHS

we prove that convolution of two signals time domain and frequency domain is equivalent of multiplication of spectra time frequency.

2/15

Name of the Student : K. Lilly Padma Regd. No. 22KE1A0414 Branch ECE

B.Tech / M.Tech / MBA Year : 2 Sem : Subject : 5/5 Sign of the Invigilator :

Date 30.11.2023

3
6. A linear time invariant continuous time system is represented by differential equations and linear time invariant discrete time system is represented by different equations. The z transform place the same role for discrete time system, as that plays by laplace transformation for coutinuous time system.

laplace transform is a powerfull mathematical tool to convert the differential equations into algebraic equations to the z transformes is a powerful mathematical tool to convert difference into algebraic equations. The range value of z which x(z) convergous is called the Roc of x(z)

The bilateral or two sided z transform of a discrete time(system) signal or sequence $x(n)$ is defined as $X(z) = \sum_{n=-\infty}^{\infty} x(n) z^{-n}$

where z is a complex variable, The one sided or uni lateral z transformer is

$$X(z) = \sum_{n=0}^{\infty} x(n) z^{-n}$$

<u>Limitation's</u>:-

frequency domain response cannot be achieved and cannot be plotted.

$x(n) = d(n)$ $d(n)$ $\begin{cases} 1 & n<0 \\ 0 & n>0 \end{cases}$

$X(z) = z\{x(n)\} = z\{d(n)\}$

$$\sum_{n=0}^{\infty} d(n) z^{-n}$$

$X(z) = 1$

$d(n) \xleftrightarrow{ZT} 1$ for all z

relationship between bandwith risetime

consider the transfer function of low pass filter and is given by

$$H(\omega) = |H(\omega)| e^{-j\omega t_d}$$

$$|H(\omega)| = \begin{cases} 1 & |\omega| < \omega_c \\ 0 & |\omega| > \omega_c \end{cases}$$

$$H(\omega) = \begin{cases} e^{-j\omega t_d} & |\omega| < \omega_c \\ 0 & |\omega| > \omega_c \end{cases}$$

⇒ cut of frequency

to find transfer function h(t) from H(ω) apply inverse fourier transform function

$$h(t) = \frac{1}{2\pi} \int_{-\infty}^{\infty} H(\omega) e^{j\omega t} d\omega$$

$$= \frac{1}{2\pi} \int_{-\omega_c}^{\omega_c} e^{-j\omega t_d} e^{j\omega t} d\omega$$

$$= \frac{1}{2\pi} \int_{-\omega_c}^{\omega_c} e^{j\omega (t - t_d)} d\omega$$

$$\frac{1}{2\pi}\left[\frac{e^{j\omega(t-t_d)}}{j(t-t_d)}\right]_{-\omega_c}^{\omega_c}$$

$$\frac{1}{2\pi}\left[\frac{e^{j\omega_c(t-t_d)}-e^{-j\omega_c(t-t_d)}}{j(t-t_d)}\right]$$

$$\frac{\sin\omega_c(t-t_d)}{\pi(t-t_d)}\times\frac{\omega_c}{\omega_c}$$

$$\frac{\omega_c}{\pi}\,\frac{\sin\omega_c(t-t_d)}{\omega_c(t-t_d)}$$

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II B.TECH, I SEM II INTERNAL EXAMINATIOS, NOV: 2023(R20) **Branches:**ECE

COURSE: SIGNALS & SYSTEMS (UNIVERSITY CODE: 201201)

Max. Marks: 15 **Time:** 90 min **Date:** 30/11/2023

(COURSECODE:R2021043)

Answer all the questions REGD NO:

Q.NO	QUESTIONS	CO	*RBTL*	*Marks*
1	Derive the relationship between bandwidth and risetime.	41043.3	L3	5
2	Explain about the Graphical and analytical proof for band Limited Signals.	41043.4	L3	5
3.a	State and Prove Initial Value Theorem and Final Value Theorem of Laplace Transform.	41043.5	L3	2.5
3.b	State and Prove time Convolution and time Shifting Properties of Z Transform.	41043.5	L3	2.5

***Level 1(Analyze): * Level 2 (Understand): * Level 3 (Apply):**

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Name of the Student : ch. Alekhya   Regd. No 23KESA0410 Branch ECE-A

B.Tech / M.Tech / MBA Year : II   Sem : I   Subject : S & S   Sign of the Invigilator :

Date 30/11/2023

5+5+2½+2½

1. Relationship between bandwidth and risetime:

we know that transfer function of an ideal LPF

$$H(\omega) = |H(\omega)| e^{-j\omega t_d}$$

$$|H(\omega)| = \begin{cases} 1 & |\omega| < \omega_c \\ 0 & |\omega| > \omega_c \end{cases}$$

ω_c is cut-off frequency

$$H(\omega) = \begin{cases} e^{-j\omega t_d} & |\omega| \le \omega_c \\ 0 & |\omega| > \omega_c \end{cases}$$

To obtain the impulse signal $h(t)$ of an ideal LPF apply the inverse fourier transform to transfer function $H(\omega)$

$$h(t) = F^{-1}[H(\omega)]$$

$$h(t) = \frac{1}{2\pi} \int_{-\omega_c}^{\omega_c} e^{-j\omega t_d} e^{j\omega t} d\omega$$

$$h(t) = \frac{1}{2\pi} \int_{-\omega_c}^{\omega_c} e^{j\omega(t-t_d)} d\omega$$

$$h(t) = \frac{1}{2\pi}\left[\frac{e^{j\omega(t-t_d)}}{j(t-t_d)}\right]_{-\omega_c}^{\omega_c}$$

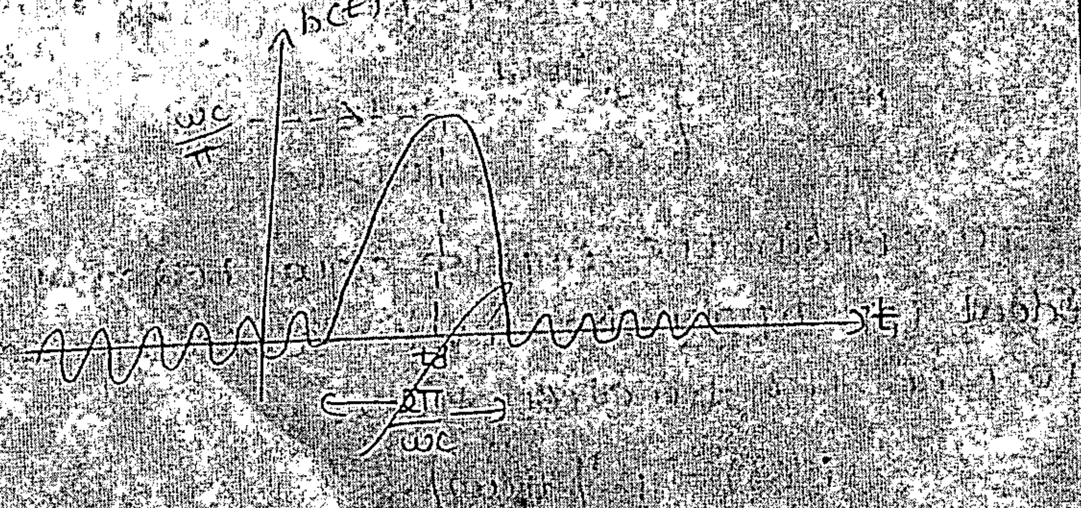
$$h(t) = \frac{1}{2\pi}\left[\frac{e^{j\omega_c(t-t_d)} - e^{-j\omega_c(t-t_d)}}{j(t-t_d)}\right]$$

$$h(t) = \frac{1}{\pi(t-t_d)}\left[\frac{e^{j\omega_c(t-t_d)} - e^{-j\omega_c(t-t_d)}}{2j}\right] \qquad \left[\sin\theta = \frac{e^{j\theta}-e^{-j\theta}}{2j}\right]$$

$$h(t) = \frac{1}{\pi(t-t_d)} \sin\omega_c(t-t_d) \times \frac{\omega_c}{\omega_c}$$

$$h(t) = \frac{\omega_c}{\pi} \cdot \frac{\sin\omega_c(t-t_d)}{\omega_c(t-t_d)} \qquad \left[\frac{\sin x}{x} = \text{sinc}\, x\right]$$

$$\boxed{h(t) = \frac{\omega_c}{\pi}\, \text{sinc}\, \omega_c(t-t_d)}$$



$$y(t) = h(t) * u(t)$$

$$y(t) = \int_{-\infty}^{t} h(\tau)\, u(t-\tau)$$

$$y(t) = \int_{-\infty}^{w_c(t-t_d)} \frac{w_c}{\pi} \frac{\sin w_c(\tau - t_d)}{w_c(\tau - t_d)} d\tau$$

$w_c(\tau - t_d) = x$ (t_d is constant)

$$d\tau = \frac{dx}{w_c}$$

$$y(t) = \int_{-\infty}^{w_c(t-t_d)} \frac{w_c}{\pi} \frac{\sin x}{x} \frac{dx}{w_c} \qquad \left[\int \frac{\sin x}{x} = si(x)\right]$$

$$y(t) = \frac{1}{\pi} [si(x)]_{-\infty}^{w_c(t-t_d)}$$

$si(x)$ is an sine integral function

Properties of $si(x)$:

$si(x)$ is an odd function

1. $si(-x) = -si(x)$
2. $si(0) = 0$
3. $si(\infty) = \pi/2$ $\quad si(-\infty) = -\frac{\pi}{2}$

$$y(t) = \frac{1}{\pi}\left[si(w_c(t-t_d)) - si(-\infty)\right]$$

$$= \frac{1}{\pi}\left[si(w_c(t-t_d)) + \frac{\pi}{2}\right]$$

$$= \frac{1}{\pi} si(w_c(t-t_d)) + \frac{1}{\pi} \cdot \frac{\pi}{2}$$

$$= \frac{1}{2} + \frac{1}{\pi} si(w_c(t-t_d))$$

If $w_c \to \infty$

$$y(t) = \frac{1}{2} + \frac{1}{\pi} si(\infty(t-t_d))$$

$$y(t) = \frac{1}{2} + \frac{1}{\pi} \cdot \frac{\pi}{2}$$

$$y(t) = \frac{1}{2} + \frac{1}{2} = \frac{2}{2} = 1$$

If $\omega c \to -\infty$

$$y(t) = \frac{1}{2} + \frac{1}{\pi} si(\omega c(t-td))$$

$$= \frac{1}{2} + \frac{1}{\pi} \cdot \frac{-\pi}{2}$$

$$= \frac{1}{2} - \frac{1}{2}$$

$$= 0$$

The rise time is defined as the time required for the response to reach from 0% to 100% of final value

To obtain tr diff y(t) wrt to t and t=td

$$y(t) = \int_{-\infty}^{t} \frac{\omega c}{\pi} \frac{\sin \omega c(t-td)}{\omega c(t-td)} dt$$

$$\left.\frac{dy(t)}{dt}\right|_{t=td} = \frac{1}{tr}$$

$$\frac{1}{t_r} = \frac{\omega_c}{\pi} \left.\frac{\sin \omega_c(t-t_d)}{\omega_c(t-t_d)}\right|_{t=t_d}$$

By Applying L-Hospital rule

$$\frac{1}{t_r} = \frac{\omega_c}{\pi} \left.\frac{\cos \omega_c(t-t_d) \cdot \omega_c}{\omega_c}\right|_{t=t_d}$$

$$\frac{1}{t_r} = \frac{\omega_c}{\pi} \cos \omega_c(t_d-t_d)$$

$$\frac{1}{t_r} = \frac{\omega_c}{\pi}$$

$$t_r = \frac{\pi}{\omega_c} = \frac{\pi}{B\omega}$$

In LPF $\omega_c \longrightarrow$ Band width

Rise time is inversly proportional to Band width

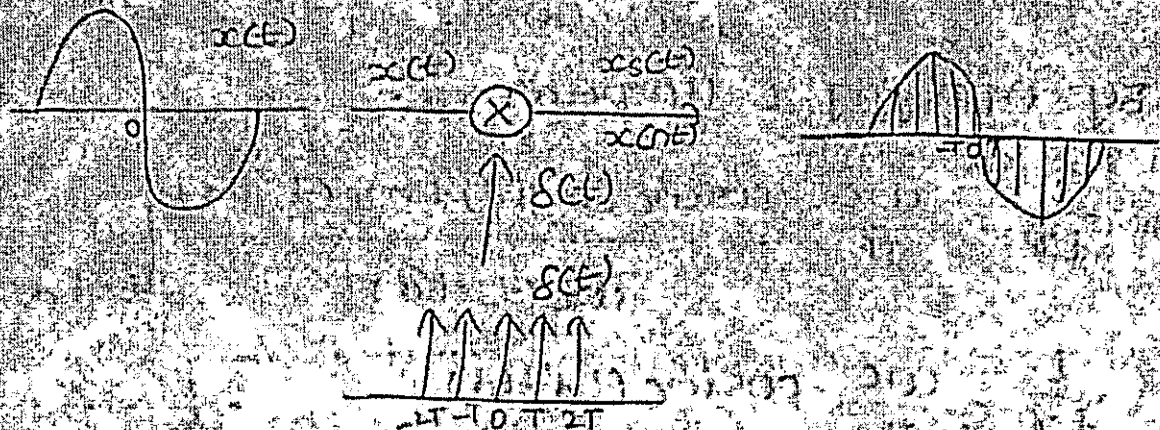
$$t_r \times B\omega = \pi$$

Rise time $\times$ Bandwidth = constant

2. Sampling Theorem:

It states that "A band limited signal $x(t)$ with $X(\omega)=0$ for $|\omega| > \omega_m$ can be represented into samples and uniquely determined from samples $x(nT)$. If the sampling frequency $f_s \geq 2f_m$ where f_m is

highest
any frequency component present in it. That is for signal recovery: sampling frequency must be atleast twice the highest frequency present in the signal.



$x_s(t) = x(t)\,\delta(t)$ —①

$x_s(t) = x(t)\,\delta(t-nT)$ —②

$\delta(t-nT) = \sum_{n=-\infty}^{\infty} C_n e^{jn\omega_s t}$ —③

$C_n = \frac{1}{T}\int_{-T/2}^{T/2} \delta(t)\, e^{-jn\omega_s t}\, dt$

If $t=0$

$C_n = \frac{1}{T}$

$\boxed{C_n = \frac{1}{T}}$

sub C_n in eq ③

$\delta(t-nT) = \sum_{n=-\infty}^{\infty} \frac{1}{T} e^{jn\omega_s t}$ —④

sub eq ④ in eq ②

$$xs(t) = x(t) \sum_{n=-\infty}^{\infty} \frac{1}{T} e^{jn\omega st}$$

$$xs(t) = \frac{1}{T} \sum_{n=-\infty}^{\infty} x(t) e^{jn\omega st} \quad (5)$$

Apply Fourier Transform on both sides

$$F[xs(t)] = \frac{1}{T} \sum_{n=-\infty}^{\infty} F[x(t) e^{jn\omega st}]$$

$$F[x(t) e^{jn\omega st}] = x[\omega - n\omega s]$$

$$xs(\omega) = \frac{1}{T} \sum_{n=-\infty}^{\infty} x[\omega - n\omega s]$$

$$xs(\omega) = fs \sum_{n=-\infty}^{\infty} x\left[f - n\frac{2\pi}{T}s\right] \quad \left[\frac{1}{T} = fs\right]$$

$$xs(\omega) = fs \sum_{n=-\infty}^{\infty} x[f - nfs] \quad (6)$$

$x(\omega)$ & $x(f)$ are spectrum of input signal and $xs(\omega)$ & $xs(f)$ are spectrum of sampled signal

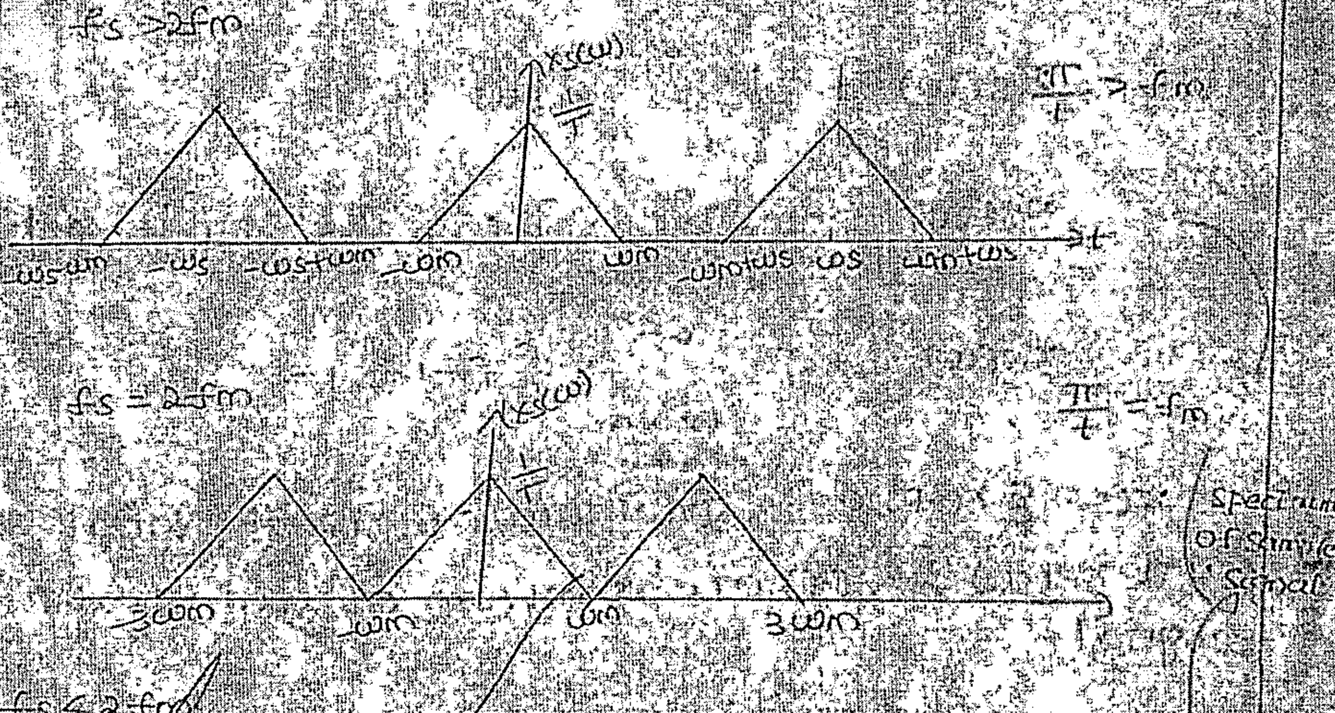
The condition to be satisfied for the recovery of signal from its samples are

$\omega s - \omega m \geq \omega m$ (or) $fs - fm \geq fm$

$\omega s \geq 2\omega m$ $fs \geq 2fm$

The conditions to be satisified for the x(t) to recover from its samples

1. x(t) should be band limited to some frequency ω_m
2. The sample frequency ω_s should be atleast twice the band limited signal ω_m i.e $[\omega_s \geq 2\omega_m]$



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Regd. No. 23KESA0403

ADDITIONAL SHEET

Sign of the Invigilator

3a) initial value theorem:
statement
If $x(t) \xleftrightarrow{LT} X(s)$

then $\underset{t\to 0}{Lt}\ x(t) = x(0) = \underset{s\to\infty}{Lt}\ sX(s)$

proof:

we know

$L\{x(t)\} = X(s)$

we are using Time differentiating property

$\frac{d(x(t))}{dt} = sX(s) - x(0)$

sub $x(t) = \frac{dx(t)}{dt}$

we know that

$X(s) = \int_{-\infty}^{\infty} x(t) e^{-st} dt$

$L\left\{\frac{dx(t)}{dt}\right\} = \int_{-\infty}^{\infty} \frac{dx(t)}{dt} e^{-st} dt = sX(s) - x(0)$

Apply limit $s\to\infty$ on both sides

$\underset{s\to\infty}{Lt}\ L\left\{\frac{dx(t)}{dt}\right\} = \underset{s\to\infty}{Lt} \int_{-\infty}^{\infty} \frac{dx(t)}{dt} e^{-st} dt$

$0 = \underset{s\to\infty}{Lt}\ sX(s) - x(0)$

$$x(0) = \underset{s \to \infty}{Lt}\ sX(s)$$

$$\boxed{\underset{t \to 0}{Lt}\ x(t) = x(0) = \underset{s \to \infty}{Lt}\ sX(s)}$$

Final value Theorem:

Statement:

If $x(t) \xleftrightarrow{LT} X(s)$

then $\underset{t \to \infty}{Lt}\ x(t) = x(\infty) = \underset{s \to 0}{Lt}\ sX(s)$

Proof:

we know that

$$L[x(t)] = X(s)$$

To get final value theorem we are using time differentiating property

$$\frac{dx(t)}{dt} = sX(s) - x(0)$$

$$\frac{dx(t)}{dt} = x(t)$$

$$L\left[\frac{dx(t)}{dt}\right] = \int_0^\infty \frac{dx(t)}{dt} e^{-st} dt = sX(s) - x(0)$$

Apply limit $s \to 0$ on both sides

$$\underset{s \to 0}{Lt} \int_0^\infty \frac{dx(t)}{dt} dt = \underset{s \to 0}{Lt}\ sX(s) - x(0)$$

$$[x(t)]_0^\infty = \underset{s \to 0}{Lt}\ sX(s) - x(0)$$

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ADDITIONAL SHEET

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Sign of the Invigilator: ......

$$x(\infty) - x(0) = \underset{s \to 0}{Lt}\ sX(s) - x(0)$$

$$x(\infty) = \underset{s \to 0}{Lt}\ sX(s)$$

$$\underset{t \to \infty}{Lt}\ x(t) = x(\infty) = \underset{s \to 0}{Lt}\ sX(s)$$

2

3b. Time convolution:

Statement:

If $x_1(n) \xleftrightarrow{ZT} X_1(Z)$

$x_2(n) \xleftrightarrow{ZT} X_2(Z)$

then $x_1(n) * x_2(n) \xleftrightarrow{ZT} X_1(Z) \cdot X_2(Z)$

proof:

we know that

$$X(Z) = \sum_{n=-\infty}^{\infty} x(n) Z^{-n}$$

$$X(Z) = \sum_{n=-\infty}^{\infty} x_1(n) * x_2(n) Z^{-n}$$

$$X(Z) = \sum_{n=-\infty}^{\infty} \sum_{m=-\infty}^{\infty} x_1(m) * x_2(n-m) Z^{-n}$$

changing the variable

$\therefore n-m = P \quad n = P+m$

$$X(Z) = \sum_{P=-\infty}^{\infty} \sum_{m=-\infty}^{\infty} x_1(m) x_2(P) Z^{-(P+m)}$$

$$X(Z) = \sum_{P=-\infty}^{\infty} \sum_{m=-\infty}^{\infty} x_1(m) x_2(P) Z^{-P} Z^{-m}$$

$$X(z) = \sum_{m=-\infty}^{\infty} x_1(m) z^{-m} \cdot \sum_{p=-\infty}^{\infty} x_2(p) z^{-p}$$

$$X(z) = X_1(z) X_2(z)$$

$$x_1(n) * x_2(n) = X_1(z) \cdot X_2(z)$$

Time shifting:

Statement: If $x(n) \overset{ZT}{\longleftrightarrow} X(z)$

then $x(n-m) \overset{ZT}{\longleftrightarrow} z^{-m} X(z)$

proof:

$$X(z) = \sum_{n=0}^{\infty} x(n) z^{-n}$$

$$X(z) = \sum_{n=0}^{\infty} x(n-m) z^{-n}$$

changing the variable

$n-m=p \qquad n=p+m$

$$X(z) = \sum_{n=0}^{\infty} x(p) z^{-p} z^{-m}$$

$$X(z) = z^{-m} \sum_{n=0}^{\infty} x(p) z^{-p}$$

$$X(z) = z^{-m} X(z)$$

$$x(n-m) = z^{-m} X(z)$$

Hence proved.

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03/15

Name of the Student : K. Lilly Padma Regd. No 22KE1A0444 Branch ECE

B.Tech / M.Tech / MBA Year : 2 Sem : 1 Subject : S&S Sign of the Invigilator :

Date

1.a :- –
1.b :- 1
2.a :- –
2.b :- –
3. :- 2
(3)

5 convolution in time domain and frequency domain

$F_T\ e^{-j\omega t}\,d\alpha\ x_1(t)\ x_2(t)\ e^{-j\omega d}\ d\alpha\ dp\ e^{-j(\omega d)}\ dt$

$F_T \int_{-\infty}^{\infty} F_T\,(x(t)]\ e^{-j\omega t}\,dt\ e^{-j\omega d}\,d\alpha\ e^{-j\omega d}\,dt$

$\int_{-\infty}^{\infty} (x(t)]\ e^{-j\omega d}\,d\alpha : e^{-j\omega d}\,d\alpha\ e^{-j(\omega d)}\,dt$

$\frac{1}{2\pi} \int_{-\infty}^{\infty} (x(t)]\ e^{-j\omega d}\,d\alpha\ e^{-j(\omega d)}\,dt\ e^{-j(\omega d)}\,dt$

$\int_{-\infty}^{\infty}\int_{-\infty}^{\infty} 1/2\pi\ e^{-j\omega d}\,dp\ e^{-j\omega p}\,dt\ e^{-j\omega d}\,dp\ e^{-j(\omega p d)}\,dt$

$\int_{-\infty}^{\infty}\int_{-\infty}^{\infty} e^{-j\omega d}\,d\alpha\ d\alpha\ e^{-j\omega d}\,dt\ e^{-j(\omega d)}\,dt$

$dt = p$

$dT : T$

$\frac{1}{2\pi} \int_{-\infty}^{\infty} [f(t-\tau)\, c(\tau)] \int_{-\infty}^{\infty} e^{-j\omega t} \, d\tau \quad e^{-j\omega \tau} \, d\tau$

$e^{-j\omega \tau} \, d\tau$

$e^{-j\omega d} \, d\tau \quad e^{j(\omega d)} \, dt$

$f x (e^{-j\omega t} \, dx \quad x_1(t) \, x_2(t)$

$(X_1(x)\omega * X_2(x)\omega)$

$\int_{-\infty}^{\infty} X_1(x)\omega * X_2(x)\omega \int_{-\infty}^{\infty} e^{-j\omega t} \, dt$

$e^{-j\omega t} \, dt \quad X_1 * \omega \quad X_2(\omega) \, dt$

$\int_{-\infty}^{\infty} e^{-j\omega t} \, dt \quad f x(t) \; (e^{-j\omega t} \, dt$

1b) The analogy between vectors and signals for orthogonality it becomes the Energy and Power signals to obtain the exponential fs coefficient to the signal and the analysis the orthogonality to combined the power system to the

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Subject Code	C204
Subject Name	SIGNALS & SYSTEMS
Regulation	R20
Year & Semester	II &I
Academic Year	2023-24

CO & BL EVALUATION – MID I EXAMINATION

Date: **11/10/23**

Subject Name : SIGNALS & SYSTEMS

Year / Semester : II/ I

Degree / Branch : B.Tech / ECE

Academic Year : 2023-2024

Q.No.	QUESTIONS	CO	*RBTL*	*Marks*
1.a	Justify whether the following are Energy or Power signals. (i) $x(t) = e^{-at}u(t)$ (ii) $x[n] = 0.5^n u[n]$ (iii) $x(t) = sin^2\omega_o t$. If power signals find *r.m.s.* value.	204.1	Apply	3
1.b	Analyze the analogy between vectors and signals for orthogonality.	204.1	Analyze	2
2.a	Apply FS principle to obtain complex exponential FS coefficients of the signal $x(t) = sin3\pi t + 2\cos 4\pi t$	204.2	Evaluate	2
2.b	State and prove differentiation and integration properties of FT.	204.2	Apply	3
3	Discuss the concept of convolution in time domain and frequency domain.	204.3	Evaluate	5

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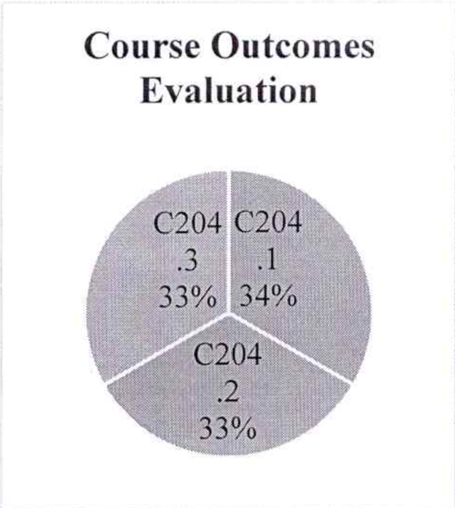
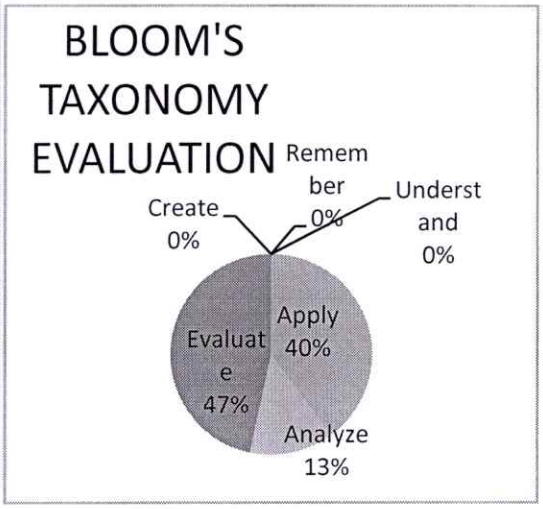
Course Outcome Number	Marks Allotted	CO %		Taxonomy level	Marks Allotted	Taxonomy Level %
C204.1	5	33.33		Remember	0	0.00
C204.2	5	33.33		Understand	0	0.00
C204.3	5	33.33		Apply	6	40.00
Total Marks	15	100		Analyze	2	13.33
				Evaluate	7	46.67
				Create	0	
				Total Marks	15	100





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CO & BL EVALUATION – MID II EXAMINATION

Date: **11/10/23**

Subject Name : SIGNALS & SYSTEMS
Year / Semester : II/ I
Degree / Branch : B.Tech / ECE
Academic Year : 2023-2024

Q.NO	QUESTIONS	CO	*RBTL*	*Marks*
1	Derive the relationship between bandwidth and risetime.	204.3	Apply	5
2	Explain about the Graphical and analytical proof for band Limited Signals.	204.4	Apply	5
3.a	State and Prove Initial Value Theorem and Final Value Theorem of Laplace Transform.	204.5	Apply	2.5
3.b	State and Prove time Convolution and time Shifting Properties of Z Transform.	204.5	Apply	2.5

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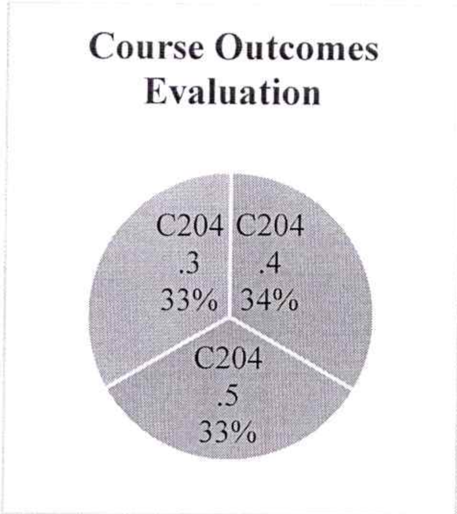
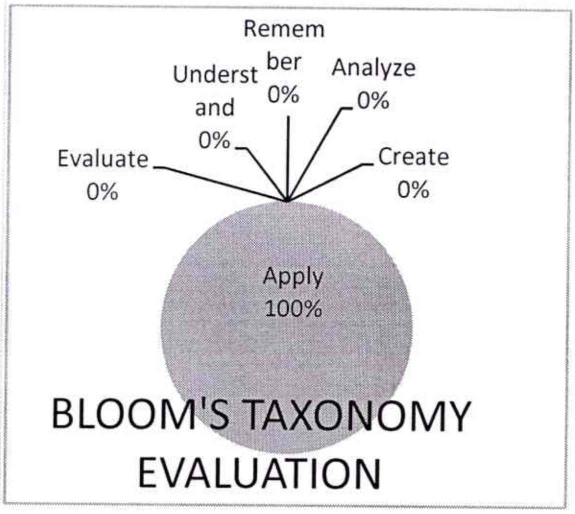
ESTD : 2008

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Outcome Number	Marks Allotted	CO %		Taxonomy level	Marks Allotted	Taxonomy Level %
C204.3	5	33.33		Remember	0	0
C204.4	5	33.33		Understand	0	0
C204.5	5	33.33		Apply	15	100
Total Marks	15	100		Analyze	0	0.00
				Evaluate	0	0.00
				Create	0	0.00
				Total Marks	15	100





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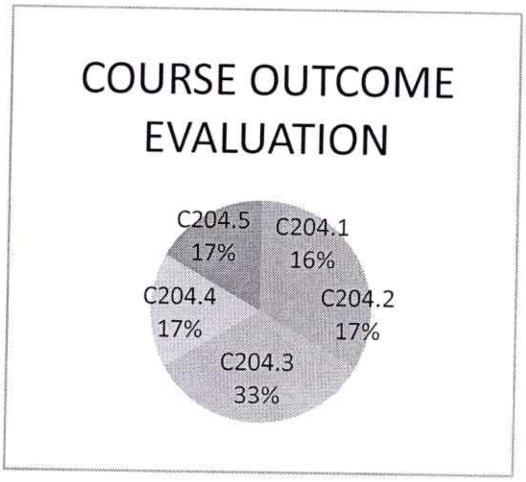
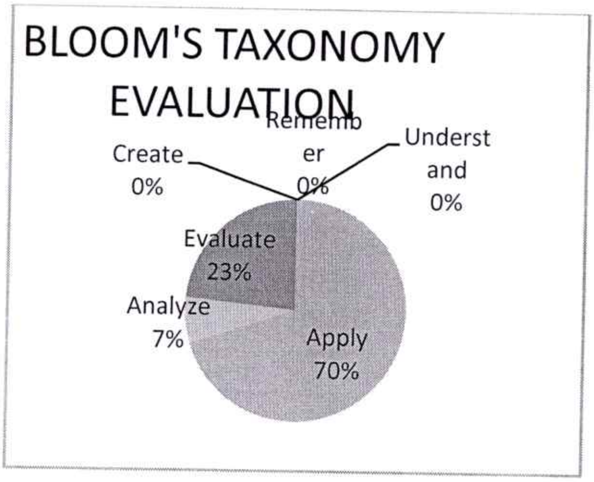
CO & BL EVALUATION – MID I & II EXAMINATION

Course Outcome Number	Marks Allotted	CO %		Taxonomy level	Marks Allotted	Taxonomy Level %
C204.1	5	16.67		Remember	0	0
C204.2	5	16.67		Understand	0	0
C204.3	10	33.33		Apply	21	70.00
C204.4	5	16.67		Analyze	2	6.67
C204.5	5	16.67		Evaluate	7	23.33
				Create	0	0.00
Total Marks	30	100		Total Marks	30	100





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A.Y.: 2023-24

Date:-30/9/23

Subject Code	C204
Subject Name	SIGNALS & SYSTEMS
Regulation	R20
Year & Semester	II & I
Academic Year	2023-24

SCHEME OF EVALUATION – ASSIGNMENT I EXAMINATION

Q.No.	Assignment Question	Marks Allotted	Course Outcome mapping	Taxonomy level
A1.1	Distinguish between i) Linear and non linear systems ii) Time variant and Time invariant systems iii) Stable and Unstable systems.	1.5	C204.1	Analyze
A1.2	State and Prove Convolution property and Parseval's relation of Fourier series.	1.5	C204.2	Analyze
A1.3	What is Impulse Response? Show that the response of an LTI system is convolution integral of its impulse Response with input signal?	2	C204.3	Analyze

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Date:-23/11/23

SCHEME OF EVALUATION – ASSIGNMENT II EXAMINATION

Q.No.	Question	Marks Allotted	Course Outcome mapping	Taxonomy level
A2.1	Derive the relationship between bandwidth and rise time.	1.5	C204.3	Analyze
A2.2	Explain the difference between Impulse, Natural and Top Sampling.	1.5	C204.4	Analyze
A2.3	State and prove initial-value theorem, final value theorem of Laplace transforms.	2	C204.5	Analyze

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CO & BL EVALUATION – ASSIGNMENT I EXAMINATION

Date:30/9/23

Subject Name : SIGNALS & SYSTEMS

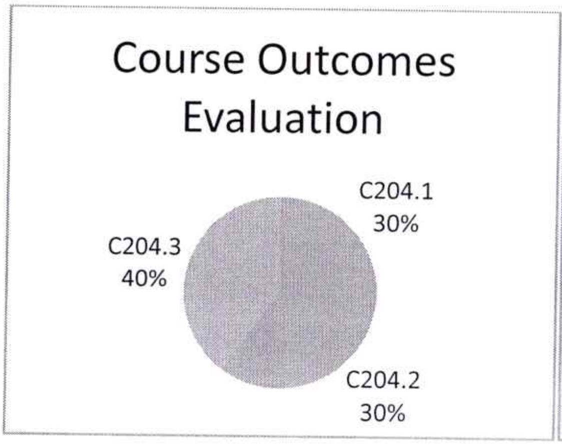
Year / Semester : II/ I

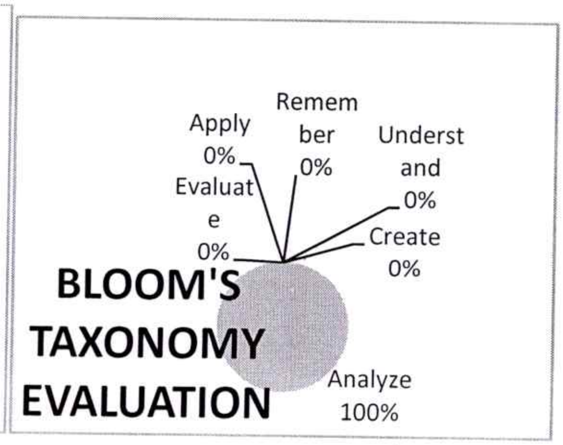
Degree / Branch : B.Tech / ECE

Academic Year : 2023-2024

Course Outcome Number	Marks Allotted	CO %
C204.1	1.5	30
C204.2	1.5	30
C204.3	2	40
Total Marks	5	100

Taxonomy level	Marks Allotted	Taxonomy Level %
Remember	0	0.00
Understand	0	0.00
Apply	0	0.00
Analyze	5	100.00
Evaluate	0	0
Create	0	
Total Marks	5	100





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Faculty In-charge

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Pulladigunta (V) Vatticherukuru (M), Guntur (Dist.)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CO & BL EVALUATION – ASSIGNMENT II EXAMINATION

Date: 23/11/23

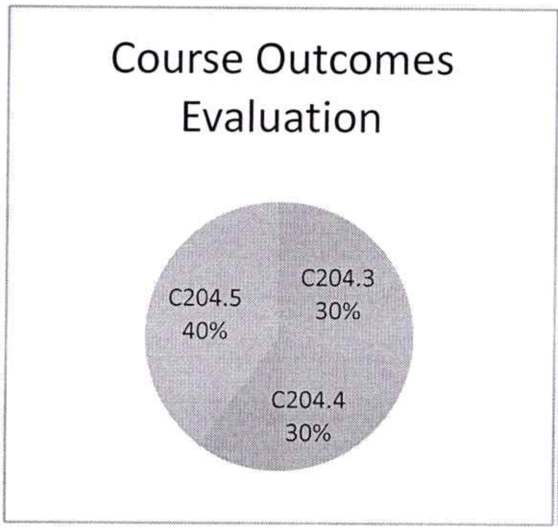
Subject Name : SIGNALS & SYSTEMS

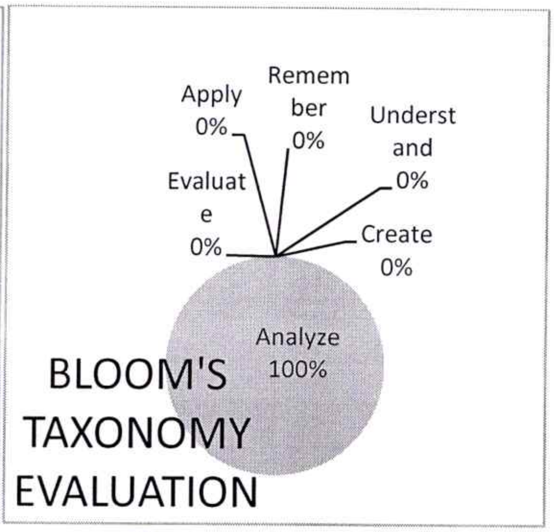
Year / Semester : II/ I

Degree / Branch : B.Tech / ECE

Academic Year : 2023-2024

Course Outcome Number	Marks Allotted	CO %	Taxonomy level	Marks Allotted	Taxonomy Level %
C204.3	1.5	30	Remember	0	0
C204.4	1.5	30	Understand	0	0
C204.5	2	40	Apply	0	0.00
Total Marks	5	100	Analyze	5	100.00
			Evaluate	0	0.00
			Create	0	0.00
			Total Marks	5	100





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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CO & BL EVALUATION – ASSIGNMENT I & II EXAMINATION

Date: 25/11/23

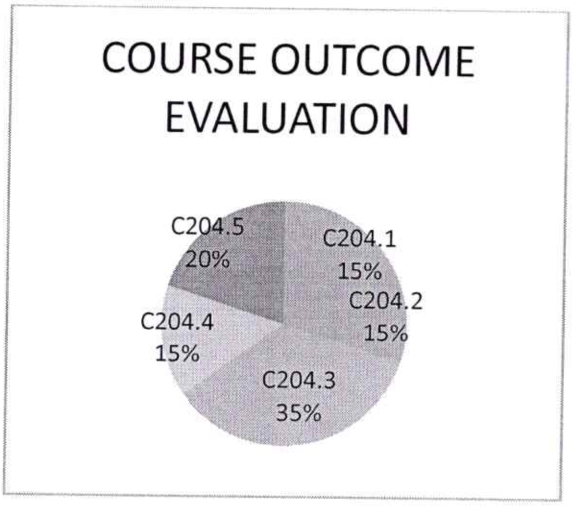
Subject Name : SIGNALS & SYSTEMS

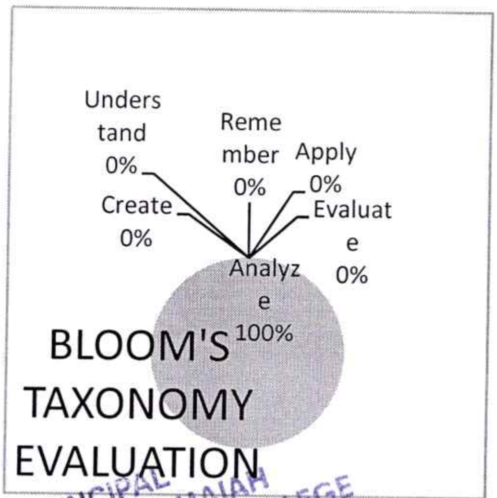
Year / Semester : II/ I

Degree / Branch : B.Tech / ECE

Academic Year : 2023-2024

Course Outcome Number	Marks Allotted	CO %		Taxonomy level	Marks Allotted	Taxonomy Level %
C204.1	1.5	15.00		Remember	0	0
C204.2	1.5	15.00		Understand	0	0
C204.3	3.5	35.00		Apply	0	0.00
C204.4	1.5	15.00		Analyze	10	100.00
C204.5	2	20.00		Evaluate	0	0.00
				Create	0	0.00
Total Marks	10	100		Total Marks	10	100





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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

A.Y.: 2023-24 Date: 4/12/23

Subject Code	C204
Subject Name	SIGNALS & SYSTEMS
Regulation	R20
Year & Semester	II & I
Academic Year	2023-24

IMPROVEMENT AFTER REMEDIAL CLASS FOR SLOW LEARNERS IN THE COURSE

Section A:

Name of the Subject		S&S				S&S			
SNO	**REGDNO**	**M-I**	**Q-1**	**A-1**	**T-I**	**M-II**	**Q-2**	**A-2**	**T-2**
1	22KE1A0427	8	1	5	14	10	3	5	18
2	22KE1A0435	10	0	5	15	12.5	3	5	20.5
3	22KE1A0437	8	2	5	15	13	4	5	22
4	22KE1A0439	0		5	5	11.5	2	5	18.5
5	22KE1A0440	7	3	5	15	10.5	3	5	18.5
6	22KE1A0444	3	3	5	11	2	3	5	10
7	22KE1A0453	8	2	5	15	10	2	5	17

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ESTD : 2008

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

A.Y.: 2023-24

Date: 4/12/23

Subject Code	C204
Subject Name	SIGNALS & SYSTEMS
Regulation	R20
Year & Semester	II & I
Academic Year	2023-24

IMPROVEMENT AFTER REMEDIAL CLASS FOR SLOW LEARNERS IN THE COURSE

Section B

Name of the Subject		S&S				S&S			
SNO	REGDNO	M-I	Q-1	A-1	T-I	M-II	Q-2	A-2	T-II
1	22KE1A0498	5	2	5	12	9.5	2	5	16.5
2	22KE1A04A0	6	3	5	14	7.5	2	5	14.5
3	22KE1A04B7		2	5	7	7.5	9	5	21.5
4	22KE1A04D2	0		5	5	6.5	3	5	14.5
5	22KE1A04D5	7	1	5	13	2.5	3	5	10.5

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

A.Y.: 2023-24 Date: 9/10/23

Subject Code	C204
Subject Name	SIGNALS & SYSTEMS
Regulation	R20
Year & Semester	II & I
Academic Year	2023-24

LIST OF SLOW LEARNERS IN THE COURSE

Weak students: less than 50% (15) in Mid-1(30M) marks

Section A:

Name of the Subject		S&S			
SNO	**REGDNO**	**M-I**	**Q-1**	**A-1**	**T-I**
1	22KE1A0427	8	1	5	14
2	22KE1A0435	10	0	5	15
3	22KE1A0437	8	2	5	15
4	22KE1A0439	0		5	5
5	22KE1A0440	7	3	5	15
6	22KE1A0444	3	3	5	11
7	22KE1A0453	8	2	5	15

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A.Y.: 2023-24

Date: 9/10/23

Subject Code	C204
Subject Name	SIGNALS & SYSTEMS
Regulation	R20
Year & Semester	II & I
Academic Year	2023-24

LIST OF SLOW LEARNERS IN THE COURSE

Weak students: less than 50% (15) in Mid-1(30M) marks

Section B

Name of the Subject		S&S			
SNO	REGDNO	M-I	Q-1	A-1	T-I
1	22KE1A0498	5	2	5	12
2	22KE1A04A0	6	3	5	14
3	22KE1A04B7		2	5	7
4	22KE1A04D2	0		5	5
5	22KE1A04D5	7	1	5	13

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

A.Y.: 2023-24 Date: 18/10/23

Subject Code	C204
Subject Name	SIGNALS & SYSTEMS
Regulation	R20
Year & Semester	II & I
Academic Year	2023-24

TEACHING LEARNING METHODOLOGY

SEMINAR TOPICS

S.NO	TOPIC NAME	STUDENT NAME
1	Concept of Convolution	CH.S.V.K.S.MEENAKSHI(**22KE1A0419**)
2	Sampling Theorem	CH.BHANU REKHA(**22KE1A0422**)
3	Properties of Laplace Transform	D.PUJITHA(**22KE1A0426**)
4	Properties of Z Transform	K.VANAJA (**22KE1A0462**)

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

A.Y.: 2023-24 Date: 18/10/23

Subject Code	C204
Subject Name	SIGNALS & SYSTEMS
Regulation	R20
Year & Semester	II & I
Academic Year	2023-24

Section B

SEMINAR TOPICS

S.NO	TOPIC NAME	STUDENT NAME
1	Concept of Convolution	P.NAGA NAVYASRI(**22KE1A0489**)
2	Sampling Theorem	K.MEGHANA NAIDU(**22KE1A04B2**)
3	Properties of Laplace Transform	V.NAGA ANITHA(**22KE1A04C9**)
4	Properties of Z Transform	K.ALEKHYA(**23KE5A0403**)

Facilities for Advanced Learners

a) NPTEL – e-learning / web learning
b) Association activities
c) Group discussions & role play / peer discussion
d) Paper presentations & seminars
e) Brain storming sessions
f) GATE training
g) EFY magazine (department magazine)
h) IEEE/IETE journals
i) Professional society activities(IETE,ISTE,ACE)
j) Digital library (DELNET, J-GATE PLUS)
k) Central library, Dept. library

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Faculty in-charge Head of Department

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

A.Y.: 2023-24

Date: 9-10-2023

Subject Code	C204
Subject Name	SIGNALS & SYSTEMS
Regulation	R20
Year & Semester	II & I
Academic Year	2023-24

LIST OF ADVANCED LEARNERS IN THE COURSE

Bright Students: more than 75% (23) in Mid-1(30M) marks

Section A

Name of the Subject		S&S			
SNO	REGDNO	M-I	Q-1	A-1	T-I
1	22KE1A0407	15	4	5	24
2	22KE1A0416	15	4	5	24
3	22KE1A0419	15	3	5	23
4	22KE1A0422	14	5	5	24
5	22KE1A0426	14	4	5	23
6	22KE1A0462	15	4	5	24

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

A.Y.: 2023-24

Date: 9-10-2023

Subject Code	C204
Subject Name	SIGNALS & SYSTEMS
Regulation	R20
Year & Semester	II & I
Academic Year	2023-24

Section B

Name of the Subjects		S&S			
SNO	REGDNO	M-I	Q-1	A-1	T-I
1	22KE1A0476	13	5	5	23
2	22KE1A0480	15	4	5	24
3	22KE1A0489	15	3	5	23
4	22KE1A04B2	15	3	5	23
5	22KE1A04B4	14	4	5	23
6	22KE1A04C9	15	3	5	23
7	23KE5A0401	14	4	5	23
8	23KE5A0403	15	4	5	24
9	23KE5A0406	14	5	5	24

Facilities for Advanced Learners

a) NPTEL – e-learning / web learning
b) Association activities
c) Group discussions & role play / peer discussion
d) Paper presentations & seminars
e) Brain storming sessions
f) GATE training
g) EFY magazine (department magazine)
h) IEEE/IETE journals
i) Professional society activities(IETE,ISTE,ACE)
j) Digital library (DELNET, J-GATE PLUS)
k) Central library, Dept. library

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

A.Y.: 2023-24

Date: 9/10/23

Subject Code	C204
Subject Name	SIGNALS & SYSTEMS
Regulation	R20
Year & Semester	II & I
Academic Year	2023-24

Section A:

SCHEDULE OF REMEDIAL CLASSES

S.No	Topics Covered	Date	No. of Students attended out of 6
1	Basic Signals and systems	3-10-2023	6
2	Fourier Series Problems	10-10-2023	5
3	Fourier Transform Properties	17-10-2023	6
4	Sampling Theorem	31-10-2023	6
5	Laplace Transform	7-11-2023	5
6	Z Transform	14-11-2023	6

Faculty In-charge

Head of Department

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

A.Y.: 2023-24

Date: 9/10/23

Subject Code	C204
Subject Name	SIGNALS & SYSTEMS
Regulation	R20
Year & Semester	II & I
Academic Year	2023-24

Section B:

SCHEDULE OF REMEDIAL CLASSES

S.No	Topics Covered	Date	No. of Students attended out of 6
1	Basic Signals and systems	3-10-2023	6
2	Fourier Series Problems	10-10-2023	5
3	Fourier Transform Properties	17-10-2023	6
4	Sampling Theorem	31-10-2023	6
5	Laplace Transform	7-11-2023	5
6	Z Transform	14-11-2023	6

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

A.Y.: 2023-24

Date: 15/11/23

Subject Code	C204
Subject Name	SIGNALS & SYSTEMS
Regulation	R20
Year & Semester	II & I
Academic Year	2023-24

REMEDIAL CLASSES ATTENDANCE REPORT

Section A

SNO	REGDNO	3-10-2023	10-10-2023	17-10-2023	31-10-2023	7-11-2023	14-11-2023
1	22KE1A0427	1	2	3	4	5	AB
2	22KE1A0435	1	AB	2	3	4	5
3	22KE1A0437	1	2	3	4	AB	6
4	22KE1A0439	1	2	3	4	AB	6
5	22KE1A0440	1	AB	2	3	4	5
6	22KE1A0444	1	2	3	4	4	5
7	22KE1A0453	AB	1	AB	2	3	4

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

A.Y.: 2023-24

Date: 15/11/23

Subject Code	C204
Subject Name	SIGNALS & SYSTEMS
Regulation	R20
Year & Semester	II & I
Academic Year	2023-24

REMEDIAL CLASSES ATTENDANCE REPORT

Section B

SNO	REGDNO	3-10-2023	10-10-2023	17-10-2023	31-10-2023	7-11-2023	14-11-2023
1	22KE1A0498	1	2	3	4	5	6
2	22KE1A04A0	1	2	3	4	5	6
3	22KE1A04B7	1	AB	3	4	5	6
4	22KE1A04D2	1	2	3	AB	5	6
5	22KE1A04D5	1	2	3	4	5	5

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Head of the Department

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Date: 1-10-2023

CIRCULAR

It is observed that after mid-1 the following are the slow learners in II ECE (I-Sem) in Signals & Systems Course. Remedial classes are scheduled for the weak learners from 3-10-2023 to 25-11-2023.Hence the following students should attend the remedial classes regularly.

Section A:

Name of the Subject		S&S			
SNO	REGDNO	M-I	Q-1	A-1	T-I
1	22KE1A0427	8	1	5	14
2	22KE1A0435	10	0	5	15
3	22KE1A0437	8	2	5	15
4	22KE1A0439	0		5	5
5	22KE1A0440	7	3	5	15
6	22KE1A0444	3	3	5	11
	22KE1A0453	8	2	5	15

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

It is observed that after mid-1 the following are the slow learners in II ECE (I-Sem) in Signals & Systems Course. Remedial classes are scheduled for the weak learners from 3-10-2023 to 25-11-2023.Hence the following students should attend the remedial classes regularly.

LIST OF SLOW LEARNERS IN THE COURSE

Weak students: less than 50% (15) in Mid-1(30M) marks

Section B

Name of the Subject		S&S			
SNO	REGDNO	M-I	Q-1	A-1	T-I
1	22KE1A0498	5	2	5	12
2	22KE1A04A0	6	3	5	14
3	22KE1A04B7		2	5	7
4	22KE1A04D2	0		5	5
5	22KE1A04D5	7	1	5	13

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Head of Department

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

A.Y.: 2023-24

Date: 3/7/24

Subject Code	C204
Subject Name	SIGNALS & SYSTEMS
Regulation	R20
Year & Semester	II & I
Academic Year	2023-24

University Results – Regular, Revaluation, Supplementary (1st)

SNO	REGD. NO	Regular			Revaluation		
		Grade	GP	CRD 3	Grade	GP	CRD 3
1	22KE1A0401	C	7	3			
2	22KE1A0402	D	6	3			
3	22KE1A0403	D	6	3			
4	22KE1A0404	F	4	0			
5	22KE1A0405	E	5	3			
6	22KE1A0406	D	6	3			
7	22KE1A0407	F	4	0			
8	22KE1A0408	E	5	3			
9	22KE1A0409	E	5	3			
10	22KE1A0410	D	6	3			
11	22KE1A0411	C	7	3			
12	22KE1A0412	E	5	3			
13	22KE1A0413	C	7	3			
14	22KE1A0414	D	6	3			
15	22KE1A0415	E	5	3			
16	22KE1A0416	D	6	3			
17	22KE1A0417	A	9	3			

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18	22KE1A0418	D	6	3	
19	22KE1A0419	B	8	3	
20	22KE1A0420	E	5	3	
21	22KE1A0421	C	7	3	
22	22KE1A0422	D	6	3	
23	22KE1A0423	C	7	3	
24	22KE1A0424	E	5	3	
25	22KE1A0425	C	7	3	
26	22KE1A0426	D	6	3	
27	22KE1A0427	E	5	3	
28	22KE1A0428	D	6	3	
29	22KE1A0429	F	4	0	
30	22KE1A0430	D	6	3	
31	22KE1A0431	C	7	3	
32	22KE1A0432	D	6	3	
33	22KE1A0433	C	7	3	
34	22KE1A0434	E	5	3	
35	22KE1A0435	D	6	3	
36	22KE1A0437	E	5	3	
37	22KE1A0438	D	6	3	
38	22KE1A0439	E	5	3	
39	22KE1A0440	D	6	3	
40	22KE1A0441	D	6	3	
41	22KE1A0442	C	7	3	

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

42	22KE1A0443	D	6	3			
43	22KE1A0444	F	4	0			
44	22KE1A0446	C	7	3			
45	22KE1A0447	F	4	0			
46	22KE1A0448	C	7	3			
47	22KE1A0449	C	7	3			
48	22KE1A0450	F	4	0			
49	22KE1A0451	E	5	3			
50	22KE1A0452	D	6	3			
51	22KE1A0453	F	4	0			
52	22KE1A0454	D	6	3			
53	22KE1A0455	C	7	3			
54	22KE1A0456	D	6	3			
55	22KE1A0457	F	4	0			
56	22KE1A0458	E	5	3			
57	22KE1A0459	F	4	0			
58	22KE1A0460	D	6	3			
59	22KE1A0461	D	6	3			
60	22KE1A0462	C	7	3			
61	22KE1A0463	E	5	3			
62	22KE1A0464	C	7	3			
63	22KE1A0466	E	5	3			
64	22KE1A0467	F	4	0			
65	22KE1A0468	F	4	0	E	5	3

PRINCIPAL
MALINENI LAKSHMAIAH
WOMEN'S ENGINEERING COLLEGE
PULLADIGUNTA, GUNTUR-522017.

66	22KE1A0469	E	5	3	
67	22KE1A0470	C	7	3	
68	22KE1A0471	F	4	0	
69	22KE1A0472	F	4	0	
70	22KE1A0473	D	6	3	
71	22KE1A0474	E	5	3	
72	22KE1A0475	F	4	0	
73	22KE1A0476	F	4	0	
74	22KE1A0477	F	4	0	
75	22KE1A0478	D	6	3	
76	22KE1A0479	C	7	3	
77	22KE1A0480	C	7	3	
78	22KE1A0481	F	4	0	
79	22KE1A0482	D	6	3	
80	22KE1A0483	F	4	0	
81	22KE1A0484	F	4	0	
82	22KE1A0485	F	4	0	
83	22KE1A0486	D	6	3	
84	22KE1A0487	F	4	0	
85	22KE1A0488	D	6	3	
86	22KE1A0489	D	6	3	
87	22KE1A0490	E	5	3	
88	22KE1A0491	F	4	0	
89	22KE1A0492	E	5	3	

PRINCIPAL
MALINENI LAKSHMAIAH
WOMEN'S ENGINEERING COLLEGE
PULLADIGUNTA, GUNTUR-522017.

90	22KE1A0493	D	6	3	
91	22KE1A0494	D	6	3	
92	22KE1A0495	F	4	0	
93	22KE1A0496	F	4	0	
94	22KE1A0497	D	6	3	
95	22KE1A0498	E	5	3	
96	22KE1A0499	B	8	3	
97	22KE1A04A0	F	4	0	
98	22KE1A04A1	D	6	3	
99	22KE1A04A2	C	7	3	
100	22KE1A04A3	F	4	0	
101	22KE1A04A4	F	4	0	
102	22KE1A04A5	E	5	3	
103	22KE1A04A6	B	8	3	
104	22KE1A04A7	E	5	3	
105	22KE1A04A8	F	4	0	
106	22KE1A04A9	E	5	3	
107	22KE1A04B0	F	4	0	
108	22KE1A04B1	E	5	3	
109	22KE1A04B2	D	6	3	
110	22KE1A04B3	D	6	3	
111	22KE1A04B4	C	7	3	
112	22KE1A04B5	F	4	0	
113	22KE1A04B6	F	4	0	

PRINCIPAL
MALINENI LAKSHMAIAH
WOMEN'S ENGINEERING COLLEGE
PULLADIGUNTA, GUNTUR-522017.

114	22KE1A04B7	D	6	3			
115	22KE1A04B8	D	6	3			
116	22KE1A04B9	C	7	3			
117	22KE1A04C0	F	4	0	E	5	3
118	22KE1A04C1	E	5	3			
119	22KE1A04C2	D	6	3			
120	22KE1A04C3	F	4	0			
121	22KE1A04C4	F	4	0			
122	22KE1A04C5	E	5	3			
123	22KE1A04C6	C	7	3			
124	22KE1A04C7	D	6	3			
125	22KE1A04C8	F	4	0			
126	22KE1A04C9	C	7	3			
127	22KE1A04D0	D	6	3			
128	22KE1A04D1	F	4	0			
129	22KE1A04D2	F	4	0			
130	22KE1A04D3	D	6	3			
131	22KE1A04D4	D	6	3			
132	22KE1A04D5	F	4	0			
133	22KE1A04D6	F	4	0			
134	22KE1A04D7	D	6	3			
135	23KE5A0401	F	4	0			
136	23KE5A0402	F	4	0			
137	23KE5A0403	A	9	3			

MALINENI ... COLLEGE
WOMEN'S ENG...
PULLADIGUNTA, GUNTUR-522017.

138	23KE5A0404	C	7	3	
139	23KE5A0405	D	6	3	
140	23KE5A0406	D	6	3	
141	23KE5A0407	F	4	0	
142	23KE5A0408	D	6	3	
143	23KE5A0409	D	6	3	
144	23KE5A0410	E	5	3	
145	23KE5A0411	D	6	3	

Faculty In-charge

PRINCIPAL
MALINENI LAKSHMAIAH
WOMEN'S ENGINEERING COLLEGE
PULLADIGUNTA, GUNTUR-522017.

MALINENI LAKSHMAIAH WOMEN'S ENGINEERING COLLEGE

ESTD : 2008

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Pulladigunta (V) Vatticherukuru (M), Guntur (Dist.)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Subject Code	C204
Subject Name	SIGNALS & SYSTEMS
Regulation	R20
Year & Semester	II & I
Academic Year	2023-24

REMEDIAL CLASS TIME TABLE MLWEC/ECE/ TIMETABLES /23-24/CT/02

Class: II -B.Tech ECE **Semester: I** **Section: A** **W.E.F.: 3/10/23**

Period / Day	1	2	10:40 – 10:5	3	4	12:30-1:2	5	6	7	8
	9:00-09:50	09:50-10:40		10:50 – 11:40	11:40-12:30		01:20-02:10	02:10-03:00	03:00-03:50	4:00-5:00
Mond			B			LUNCH BREAK				**M-III**
Tuesd			R							**S&S**
Wednesday										**EDC**
Thursday			E							**RVSP**
Friday			A							**STLD**
Saturday			K							**RVSP**

CLASS INCHARGE **TIME TABLE INCHARGE** **HOD**

MALINENI LAKSHMAIAH WOMEN'S ENGINEERING COLLEGE PULLADIGUNTA, GUNTUR-522017.

MALINENI LAKSHMAIAH
WOMEN'S ENGINEERING COLLEGE

ESTD : 2008

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Pulladigunta (V) Vatticherukuru (M), Guntur (Dist.)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Class: II-B.Tech ECE **Semester: I** **Section: B** **W.E.F.:3/10/23**

Period / Day	1 9:00-09:50	2 09:50-10:40	10:40 – 10:5	3 10:50 – 11:40	4 11:40-12:30	12:30-1:2	5 01:20-02:10	6 02:10-03:00	7 03:00-03:50	8 4:00-5:00
Mond			B							M-III
Tuesd			R							S&S
Wednesday										EDC
Thursday			E			LUNCH BREAK				RVSP
Friday			A							STLD
Saturday			K							RVSP

CLASS IN-CHARGE TIME TABLE IN-CHARGE HOD

PRINCIPAL
MALINENI LAKSHMAIAH
WOMEN'S ENGINEERING COLLEGE
PULLADIGUNTA, GUNTUR-522017.

MALINENI LAKSHMAIAH WOMEN'S ENGINEERING COLLEGE

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Pulladigunta (V) Vatticherukuru (M), Guntur (Dist.)

ESTD : 2008

NATIONAL BOARD OF ACCREDITATION CSE & ECE - 2022-2025

NAAC A+

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE NAME -	SIGNALS & SYSTEMS
YEAR/ SEM -	II/I
COURSE CODE -	R2021043
NAME OF THE FACULTY	SK.GOUSIYA BEGUM

		CO_Q1		CO_Q2		CO_Q3					CO_Q1	CO_Q2	CO_Q3										
S.NO.	REG NO	A	B	A	B	A	DES-I	QUIZ-I	ASS-I	MID TOTAL-I	A	A	A	B	DES-II	QUIZ-II	ASS-II	MID TOTAL-II	BEST	LEAST	80	20	TOTAL
1	22KE1A0401	3	2	2		5	12	3	5	20	5	4.5	2	1	12.5	7	5	24.5	24.5	20	19.6	4	24
2	22KE1A0402	1	2	2	2	5	12	4	5	21	5	5	2		12	5	5	22	22	21	17.6	4.2	22
3	22KE1A0403	2	2	1	2	4	11		5	16	5	5	2	1.5	13.5	3	5	21.5	21.5	16	17.2	3.2	20
4	22KE1A0404	2	2	2	0	5	11	2	5	18	5	5	1.5		11.5	4	5	20.5	20.5	18	16.4	3.6	20
5	22KE1A0405	3	2	2		5	12	3	5	20	5	5	2	2	14	4	5	23	23	20	18.4	4	22
6	22KE1A0406	3	2	2		5	12	2	5	19	4	4	1.5	1	10.5	2	5	17.5	19	17.5	15.2	3.5	19
7	22KE1A0407	3	2	2	3	5	15	4	5	24	5	5	2.5	2.5	15	6	5	26	26	24	20.8	4.8	26
8	22KE1A0408		1	2		5	8	5	5	18	5	4	1.5	2.5	13	2	5	20	20	18	16	3.6	20
9	22KE1A0409	3	2	2	1	5	13	3	5	21	5	4	1.5	1.5	12	3	5	20	21	20	16.8	4	21
10	22KE1A0410	3	2	2	2	5	14	3	5	22	4	5	1.5	1.5	12	4	5	21	22	21	17.6	4.2	22
11	22KE1A0411	3	2	2	2	3	12	3	5	20	5	5	2.5	2	14.5	2	5	21.5	21.5	20	17.2	4	21
12	22KE1A0412	3	2	2	1	5	13	3	5	21	5	5	0		10	3	5	18	21	18	16.8	3.6	20
13	22KE1A0413	2	2	2	1	3	10	3	5	18	4	5		2	11	2	5	18	18	18	14.4	3.6	18
14	22KE1A0414	2	2	2		5	11	3	5	19	5		1		6	2	5	13	19	13	15.2	2.6	18
15	22KE1A0415	3	2	2		4	11	2	5	18	5	5		2	12	4	5	21	21	18	16.8	3.6	20
16	22KE1A0416	3	2	2	3	5	15	4	5	24	4	4	2.5	1.5	12	3	5	20	24	20	19.2	4	23
17	22KE1A0417	3	2	2	3	3	13	3	5	21	5	5	2.5	2	14.5	8	5	27.5	27.5	21	22	4.2	26
18	22KE1A0418	3	2	2	2	3.5	12.5	2	5	19.5	5	5	2.5	2	14.5	4	5	23.5	23.5	19.5	18.8	3.9	23
19	22KE1A0419	3	2	2	3	5	15	3	5	23	5	5	2	2.5	14.5	6	5	25.5	25.5	23	20.4	4.6	25
20	22KE1A0420	3	1	2		5	11	4	5	20	5	5	0	1.5	11.5	3	5	19.5	20	19.5	16	3.9	20
21	22KE1A0421	2	2	2	3	5	14	2	5	21	5	5	2.5	1.5	14	5	5	24	24	21	19.2	4.2	23

22	22KE1A0422	2	3	2	2	5	14	5	5	24	5	5	2.5	2.5	15	7	5	27	27	24	21.6	4.8	26
23	22KE1A0423	3	2	2	3	5	15	1	5	21	5	5	2	2.5	14.5	3	5	22.5	22.5	21	18	4.2	22
24	22KE1A0424		2	2	3	5	12	2	5	19	1.5	4	1	0	6.5	3	5	14.5	19	14.5	15.2	2.9	18
25	22KE1A0425		2	2		4	8	4	5	17	5	4	2	2.5	13.5	2	5	20.5	20.5	17	16.4	3.4	20
26	22KE1A0426	3	2	2	3	4	14	4	5	23	5	5	2.5	2.5	15	1	5	21	23	21	18.4	4.2	23
27	22KE1A0427		2	2		4	8	1	5	14	5	5	0		10	3	5	18	18	14	14.4	2.8	17
28	22KE1A0428	1	1	2	1	5	10	2	5	17	4.5	4.5	2	1	12	3	5	20	20	17	16	3.4	19
29	22KE1A0429	2	2	2	2	3	11	2	5	18	5	5	2.5	1	13.5	5	5	23.5	23.5	18	18.8	3.6	22
30	22KE1A0430	3	2	2		4	11	3	5	19	5	3.5	2.5	2.5	13.5	5	5	23.5	23.5	19	18.8	3.8	23
31	22KE1A0431	3	2	2	3	4	14	2	5	21	5	5	2.5	2.5	15	2	5	22	22	21	17.6	4.2	22
32	22KE1A0432	3	1	2	3	5	14	2	5	21	5	5	1	2.5	13.5	3	5	21.5	21.5	21	17.2	4.2	21
33	22KE1A0433	3	2	2		5	12	4	5	21	5	5	2.5	2.5	15	4	5	24	24	21	19.2	4.2	23
34	22KE1A0434		2	2		4	8	3	5	16	5	5		0.5	10.5	2	5	17.5	17.5	16	14	3.2	17
35	22KE1A0435	2	2	2	1	3	10	0	5	15	5	5	1	1.5	12.5	3	5	20.5	20.5	15	16.4	3	19
36	22KE1A0437			2	2	4	8	2	5	15	4.5	5	1.5	2	13	4	5	22	22	15	17.6	3	21
37	22KE1A0438	2	2	2		4	10	3	5	18	5	5	2	2	14	2	5	21	21	18	16.8	3.6	20
38	22KE1A0439						0		5	5	5	1.5	2.5	2.5	11.5	2	5	18.5	18.5	5	14.8	1	16
39	22KE1A0440		2	2		3	7	3	5	15	3	4	2.5	1	10.5	3	5	18.5	18.5	15	14.8	3	18
40	22KE1A0441		2	2	2	4	10	2	5	17	4	5	2.5	2.5	14	3	5	22	22	17	17.6	3.4	21
41	22KE1A0442	3	2	2		4	11	5	5	21	5	5	2.5	2.5	15	3	5	23	23	21	18.4	4.2	23
42	22KE1A0443	2	2	2		4	10	3	5	18	4.5	4.5	2	2	13	3	5	21	21	18	16.8	3.6	20
43	22KE1A0444		1			2	3	3	5	11	1			1	2	3	5	10	11	10	8.8	2	11
44	22KE1A0446	2	2	2	2	4	12	4	5	21	5	4	2.5	2.5	14	2	5	21	21	21	16.8	4.2	21
45	22KE1A0447	2	2	2	3	3	12	3	5	20	5	3.5	2.5	2	13	3	5	21	21	20	16.8	4	21
46	22KE1A0448	3	2	2	3	4	14	2	5	21	4	5	1.5	2	12.5	8	5	25.5	25.5	21	20.4	4.2	25
47	22KE1A0449	3	2	2		4.5	11.5	3	5	19.5	5	5	2.5	2.5	15	4	5	24	24	19.5	19.2	3.9	23
48	22KE1A0450	3	2	2		3	10	4	5	19	5	5			10	3	5	18	19	18	15.2	3.6	19
49	22KE1A0451	3	2	2		4	11	2	5	18	4	4	2.5	1.5	12	1	5	18	18	18	14.4	3.6	18
50	22KE1A0452	3	2	2		3	10	2	5	17	5	5	1.5		11.5	4	5	20.5	20.5	17	16.4	3.4	20
51	22KE1A0453	1	2	2		3	8	2	5	15	5	5			10	2	5	17	17	15	13.6	3	17
52	22KE1A0454	2	2	2		3	9	3	5	17	5	5	1	2	13	3	5	21	21	17	16.8	3.4	20
53	22KE1A0455	3	2	2		5	12	4	5	21	5	5	2.5	2	14.5	2	5	21.5	21.5	21	17.2	4.2	21
54	22KE1A0456		2	2	3	5	12	3	5	20	5	5	2.5	2.5	15	3	5	23	23	20	18.4	4	22
55	22KE1A0457	2	2	2	1	3	10	1	5	16	4	5			9	2	5	16	16	16	12.8	3.2	16
56	22KE1A0458	3	2	2		4	11	3	5	19	3.5	4.5	1		9	2	5	16	19	16	15.2	3.2	18
57	22KE1A0459	3	2	2		3	10	5	5	20	4	3.5			7.5	3	5	15.5	20	15.5	16	3.1	19
58	22KE1A0460		1	2		5	8	4	5	17	4.5	0		1	5.5	2	5	12.5	17	12.5	13.6	2.5	16
59	22KE1A0461	3	2	2	2	4	13	4	5	22	5	5	2.5	2.5	15	5	5	25	25	22	20	4.4	24

60	22KE1A0462	3	2	2	3	5	15	4	5	24	5	5	2.5	2	14.5	6	5	25.5	25.5	24	20.4	4.8	25
61	22KE1A0463	3	2	2		4	11	4	5	20	5	5	2	1	13	3	5	21	21	20	16.8	4	21
62	22KE1A0464	3	2	2	2	3	12	3	5	20	5	5	0	1	11	5	5	21	21	20	16.8	4	21
63	22KE1A0466	3	2	2	2	3	12	2	5	19	5	5	0.5	1.5	12	2	5	19	19	19	15.2	3.8	19
64	22KE1A0467	3	2	2	2	2	11	1	5	17	2	5	1	1	9	2	5	16	17	16	13.6	3.2	17
65	22KE1A0468	3	2	2		4	11	2	5	18	5	2	2.5	2.5	12	3	5	20	20	18	16	3.6	20
66	22KE1A0469	2	2	2	2	3	11	3	5	19	3.5	1	2.5	2	9	3	5	17	19	17	15.2	3.4	19
67	22KE1A0470	3	2	2	2	3	12	4	5	21	5	4	2	2	13	4	5	22	22	21	17.6	4.2	22
68	22KE1A0471	3	2	2	3	4	14	3	5	22	5	5		1	11	5	5	21	22	21	17.6	4.2	22
69	22KE1A0472	3	2	2	3	4	14	3	5	22	5	5	0	1	11	1	5	17	22	17	17.6	3.4	21
70	22KE1A0473	3	2	2	3	4	14	1	5	20	5	5		2.5	12.5	9	5	26.5	26.5	20	21.2	4	25
71	22KE1A0474	3	2	2		4	11	4	5	20	4	5	0	1.5	10.5	8	5	23.5	23.5	20	18.8	4	23
72	22KE1A0475	2	2	2		4	10	3	5	18	4.5		1.5	2.5	8.5	3	5	16.5	18	16.5	14.4	3.3	18
73	22KE1A0476	3	2	2	3	3	13	5	5	23	5	1	1	2	9	4	5	18	23	18	18.4	3.6	22
74	22KE1A0477	3	2		2	4	11	2	5	18	2.5		2	1	5.5	10	5	20.5	20.5	18	16.4	3.6	20
75	22KE1A0478	3	2	2	2	4	13	4	5	22	4.5	5	2.5	2.5	14.5	7	5	26.5	26.5	22	21.2	4.4	26
76	22KE1A0479	3	2	2	2	3	12	3	5	20	4.5	5	0		9.5	7	5	21.5	21.5	20	17.2	4	21
77	22KE1A0480	3	2	2	3	5	15	4	5	24	4.5	5	2.5	2.5	14.5	3	5	22.5	24	22.5	19.2	4.5	24
78	22KE1A0481	2	2	2		5	11	2	5	18	3.5		2.5	2.5	8.5	2	5	15.5	18	15.5	14.4	3.1	18
79	22KE1A0482	3	2	2	2	4	13	1	5	19	3.5	4	2.5	2.5	12.5	6	5	23.5	23.5	19	18.8	3.8	23
80	22KE1A0483	3	2	2	1	5	13	3	5	21	5	5	2	2.5	14.5	4	5	23.5	23.5	21	18.8	4.2	23
81	22KE1A0484	2	2	2		4	10	3	5	18	5	5	2.5	2	14.5	3	5	22.5	22.5	18	18	3.6	22
82	22KE1A0485		2	2		5	9	2	5	16	3.5	5	1.5	2	12	3	5	20	20	16	16	3.2	19
83	22KE1A0486	2	2	2		5	11	4	5	20	5	5	2.5		12.5	3	5	20.5	20.5	20	16.4	4	20
84	22KE1A0487	2	2	2		4	10	5	5	20	5	4	1	2.5	12.5	2	5	19.5	20	19.5	16	3.9	20
85	22KE1A0488	3	2	2		5	12	2	5	19	5	5	1.5		11.5	8	5	24.5	24.5	19	19.6	3.8	23
86	22KE1A0489	3	2	2	3	5	15	3	5	23	5	5	2.5	2.5	15	2	5	22	23	22	18.4	4.4	23
87	22KE1A0490	1	2	2	1	4	10	2	5	17	4	4.5	1.5	1	11	4	5	20	20	17	16	3.4	19
88	22KE1A0491	2	1	2	2	1	8	4	5	17	1	2.5	1	1	5.5	3	5	13.5	17	13.5	13.6	2.7	16
89	22KE1A0492	3	2	2		5	12	4	5	21	5	5	1	2.5	13.5	2	5	20.5	21	20.5	16.8	4.1	21
90	22KE1A0493	3	2	2	2	3	12	4	5	21	5	5	2.5	2.5	15	3	5	23	23	21	18.4	4.2	23
91	22KE1A0494	2	2	2	2	4	12	4	5	21	5	5	2.5	2.5	15	5	5	25	25	21	20	4.2	24
92	22KE1A0495		2	2	2	5	11	3	5	19	5	4.5	1		10.5	5	5	20.5	20.5	19	16.4	3.8	20
93	22KE1A0496	3	2	2	2	2	11	5	5	21	5	4.5	2	2.5	14	4	5	23	23	21	18.4	4.2	23
94	22KE1A0497	2	2	2	3	4	13	3	5	21	5	5	2.5	2.5	15	3	5	23	23	21	18.4	4.2	23
95	22KE1A0498		2	2		1	5	2	5	12	5	3		1.5	9.5	2	5	16.5	16.5	12	13.2	2.4	16
96	22KE1A0499	3	2	2		4	11	3	5	19	5	5	2.5	2	14.5	10	5	29.5	29.5	19	23.6	3.8	27
97	22KE1A04A0	1		2		3	6	3	5	14	5		2.5		7.5	2	5	14.5	14.5	14	11.6	2.8	14

98	22KE1A04A1	3	2	2	3	2	12	4	5	21	5	5	2.5	2.5	15	5	5	25	25	21	20	4.2	24
99	22KE1A04A2	2	2	2	3	5	14	3	5	22	2	5	2.5	1.5	11	2	5	18	22	18	17.6	3.6	21
100	22KE1A04A3		2	2	3	3	10	3	5	18	2	5	1	1.5	9.5	3	5	17.5	18	17.5	14.4	3.5	18
101	22KE1A04A4	3	2	2	2	4	13	3	5	21	5	4.5	1	1	11.5	2	5	18.5	21	18.5	16.8	3.7	21
102	22KE1A04A5	3	2	2	2	4	13	3	5	21	5	4	2.5	2	13.5	2	5	20.5	21	20.5	16.8	4.1	21
103	22KE1A04A6	3	2	2	3	4	14	2	5	21	4.5	3	1	1	9.5	4	5	18.5	21	18.5	16.8	3.7	21
104	22KE1A04A7	3	2	2	3	4	14	2	5	21	3.5	5	2.5	2.5	13.5		5	18.5	21	18.5	16.8	3.7	21
105	22KE1A04A8	1	2	2		4	9	3	5	17	4.5	5			9.5	2	5	16.5	17	16.5	13.6	3.3	17
106	22KE1A04A9	2	2	2		3	9	6	5	20	5	5		1.5	11.5	3	5	19.5	20	19.5	16	3.9	20
107	22KE1A04B0	2		2		4	8	3	5	16	5	5		2	12	2	5	19	19	16	15.2	3.2	18
108	22KE1A04B1	3	2	2	2	4	13	3	5	21	5	4	1	2.5	12.5	3	5	20.5	21	20.5	16.8	4.1	21
109	22KE1A04B2	3	2	2	3	5	15	3	5	23	5	5	2.5	2.5	15	1	5	21	23	21	18.4	4.2	23
110	22KE1A04B3	3	2	2	3	4	14	3	5	22	5	5	2	2.5	14.5	4	5	23.5	23.5	22	18.8	4.4	23
111	22KE1A04B4	3	2	2	3	4	14	4	5	23	5	5	2	2	14	5	5	24	24	23	19.2	4.6	24
112	22KE1A04B5	3	2	2	2	4	13	2	5	20	5	4.5	1.5	2.5	13.5	10	5	28.5	28.5	20	22.8	4	27
113	22KE1A04B6	1	2	2	2	3	10	2	5	17	5	2.5		0	7.5	3	5	15.5	17	15.5	13.6	3.1	17
114	22KE1A04B7							2	5	7	5	1		1.5	7.5	9	5	21.5	21.5	7	17.2	1.4	19
115	22KE1A04B8	3	2	2	3	4	14	2	5	21	5	5	2.5	2.5	15	4	5	24	24	21	19.2	4.2	23
116	22KE1A04B9	3	2	2	1	4	12	2	5	19	5	5	1.5	2.5	14	4	5	23	23	19	18.4	3.8	22
117	22KE1A04C0	3	2	2	1	4	12	2	5	19	5	5	2.5	1.5	14	5	5	24	24	19	19.2	3.8	23
118	22KE1A04C1	3	2	2	1	4	12	1	5	18	5	5	1	2	13	3	5	21	21	18	16.8	3.6	20
119	22KE1A04C2	3	2	2	3	4	14	3	5	22	2.5	4.5	1.5	1.5	10	7	5	22	22	22	17.6	4.4	22
120	22KE1A04C3	2	2	2	1	4	11	4	5	20	5	5		2.5	12.5	4	5	21.5	21.5	20	17.2	4	21
121	22KE1A04C4	2	2	2		4	10	3	5	18	5	4		2.5	11.5	3	5	19.5	19.5	18	15.6	3.6	19
122	22KE1A04C5	1	2	2		3	8	4	5	17	1.5	3	1	1.5	7	3	5	15	17	15	13.6	3	17
123	22KE1A04C6	2	3	2	3	4	14	1	5	20	5	5	1	2.5	13.5	3	5	21.5	21.5	20	17.2	4	21
124	22KE1A04C7		2	2	2	5	11	5	5	21	5	5	2.5	2.5	15	4	5	24	24	21	19.2	4.2	23
125	22KE1A04C8	3	2	2	1	4	12	3	5	20	5	5	2.5	1.5	14	4	5	23	23	20	18.4	4	22
126	22KE1A04C9	3	2	2	3	5	15	3	5	23	5	5	2	2.5	14.5	9	5	28.5	28.5	23	22.8	4.6	27
127	22KE1A04D0	3	2	2		5	12	5	5	22	4	5	0.5	2.5	12	8	5	25	25	22	20	4.4	24
128	22KE1A04D1	3	2	2		3	10	3	5	18	3	3	1.5	2	9.5	4	5	18.5	18.5	18	14.8	3.6	18
129	22KE1A04D2						0		5	5		4.5		2	6.5	3	5	14.5	14.5	5	11.6	1	13
130	22KE1A04D3	3	2	2		4	11	4	5	20	5	4	2.5	2.5	14	5	5	24	24	20	19.2	4	23
131	22KE1A04D4	3	2	2		3	10	4	5	19	5	5	2.5	2.5	15	8	5	28	28	19	22.4	3.8	26
132	22KE1A04D5		1	2	1	3	7	1	5	13	0	2.5	0		2.5	3	5	10.5	13	10.5	10.4	2.1	13
133	22KE1A04D6	2	2	2	2	3	11	5	5	21	3.5	5	1.5	1.5	11.5	8	5	24.5	24.5	21	19.6	4.2	24
134	22KE1A04D7	2	2	2	2	4	12	3	5	20	5		1.5	1.5	8	8	5	21	21	20	16.8	4	21
135	23KE5A0401	3	2	2	2	5	14	4	5	23	5	4	2.5	1.5	13	3	5	21	23	21	18.4	4.2	23

136	23KE5A0402	2	2	2	2	4	12	2	5	19	3.5	5	2.5	1	12	7	5	24	24	19	19.2	3.8	23
137	23KE5A0403	3	2	2	3	5	15	[illegible]	5	24	5	5	2.5	2.5	15	10	5	30	30	24	24	4.8	29
138	23KE5A0404	2	2	2		5	11	3	5	19	5	5	1.5	2.5	14	8	5	27	27	19	21.6	3.8	25
139	23KE5A0405	1	2	2	1	4	10	3	5	18	1.5	3.5	1.5	2	8.5	6	5	19.5	19.5	18	15.6	3.6	19
140	23KE5A0406	3	2	2	3	4	14	5	5	24	5	5	2.5	2.5	15	1	5	21	24	21	19.2	4.2	23
141	23KE5A0407	3	2	2	2	4	13	4	5	22	4	5	2.5	2.5	14	1	5	20	22	20	17.6	4	22
142	23KE5A0408	2	2	2	1	3	10	3	5	18	2	5	2.5	1.5	11	7	5	23	23	18	18.4	3.6	22
143	23KE5A0409	2	1	2		4	9	3	5	17	5	5	1.5	2	13.5	5	5	23.5	23.5	17	18.8	3.4	22
144	23KE5A0410	3	2	2		5	12	5	5	22	5	5		2.5	12.5	4	5	21.5	22	21.5	17.6	4.3	22
145	23KE5A0411	2	2	2	1	5	12	2	5	19	5	5	2.5	2.5	15	5	5	25	25	19	20	3.8	24

PRINCIPAL
MALINENI LAKSHMAIAH
WOMEN'S ENGINEERING COLLEGE
PULLADIGUNTA

Faculty In-charge

Code No: R2021043 **R20** SET - 1

II B. Tech I Semester Regular Examinations, Feb/March - 2022
SIGNALS AND SYSTEMS
(Com to ECE, EIE, ECT)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1 a) Prove the following: [7M]
(i) The power of the energy signal is zero over infinite time.
(ii) The energy of the power signal is infinite over infinite time.

b) Define the error function while approximating signals and hence derive the expression for condition for orthogonality between two waveforms $f_1(t)$ and $f_2(t)$ [7M]

Or

2 a) Define a system. How are the systems classified? Define each one of them. [7M]

b) Test the Causality and Stability of the following system [7M]
(i) $y(n) = x(n) - x(-n-1) + x(n-1)$ (ii) $y(t) = 5\, e^{-2t}\, u(t)$.

3 a) Derive the expression for Fourier Transform from Fourier Series. [7M]

b) State and prove Differentiation and integration properties of Fourier Transform. [7M]

Or

4 a) State and prove Parseval's relation of Fourier Transform. [7M]

b) Derive the relation between trigonometric and exponential Fourier series coefficients. [7M]

5 a) What is an LTI system? Explain its properties. Derive an expression for the transfer function of an LTI system. [7M]

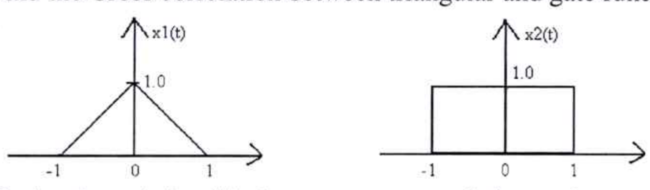
b) Explain the concept of Paley-Wiener criterion for physical realizability using relevant expressions. [7M]

Or

6 a) Explain the filter characteristics of ideal LPF, HPF and BPF using their magritude and phase responses. [7M]

b) Obtain conditions for the distortion less transmission through a system. [7M]

7 a) Find the Cross correlation between triangular and gate function as shown in below. [7M]



b) Derive the relationship between autocorrelation and energy spectral density of an energy signal. [7M]

Or

8 a) State and explain the sampling theorem for band pass signals. [7M]

b) Explain the method of detection of periodic signals in the presence of noise by correlation. [7M]
~~~~~~~~~~~~~~~~~~~~~~~~~

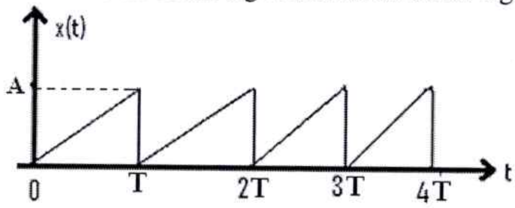
9 a) Find the Laplace Transform of the following: (i) $te^{-at}\,u(t)$ and (ii) $Cos(\omega_0 t)\,u(t)$ [7M]

b) What are the methods by which inverse z-transform can be found out? Explain any one method. [7M]

Or

10 a) State and prove time shifting and time convolution properties of z- transform. [7M]

b) Find out the Laplace transform of the signal shown in below figure. [7M]



Code No: R2021043 **R20** SET - 1

II B. Tech I Semester Supplementary Examinations, July - 2022
SIGNALS AND SYSTEMS
(Com to ECE, EIE, ECT)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks

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1 a) Find whether the following signals are even or odd : [7M]
(i) e^{4t} (ii) $u(t+2) - u(t-2)$ (iii) $u(-n+2)u(n+2)$

b) Define orthogonal signal space and explain clearly its application in representing a signal. [7M]

Or

2 a) Distinguish between [7M]
(i) Continuous-time and discrete-time systems
(ii) Static and dynamic systems
(iii) Causal and Non-Causal systems

b) Verify whether $x(t) = Ae^{-\alpha(t}. u(t).$, $\alpha > 0$ is an energy signal or not. [7M]

3 a) Obtain the Fourier transform of the following functions. (i) Unit step function,(ii) Unit impulse function. [7M]

b) Find the complex exponential Fourier series coefficient of the signal [7M]
$$x(t) = sin3\pi t + 2cos4\pi t$$

Or

4 a) Explain the Fourier transform of signum function and also sketch. It s magnitude and phase spectra. [7M]

b) What is the Significance of Hilbert Transform? Explain in detail. [7M]

5 a) Explain the characteristics of an ideal LPF? All ideal filters are physically not realizable: justify. [7M]

b) What is an LTI system? Explain the properties involved. Check whether an ideal differentiator is LTI or not. [7M]

Or

6 a) Prove that the Transmission of a pulse through a Low Pass Filter causes the dispersion of the pulse. [7M]

b) Derive the relation between bandwidth and rise time. [7M]

7 a) State and prove the sampling theorem for low pass signals. [7M]

b) Explain the detection of periodic signals in the presence of noise by cross-correlation. [7M]

Or

8 a) Compare various sampling methods. [7M]

b) Verify Parseval's theorem for the energy of the signal $x(t) = e^{-3t}u(t)$. [7M]

9 a) State and prove time convolution property of Laplace Transform. [7M]

b) Find the Z transform of $x[n] = a^{n+1} u[n+1]$. [7M]

Or

10 a) Obtain the Laplace transform of $x(t) = e^{-at} \cos(\omega_o t)\, u(-t)$ and indicate its ROC. [7M]

b) Find the Z Transform of $x[n] = na^{n-1} u[n]$. [7M]
~~~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: R2021043 **R20** SET - 1

II B. Tech I Semester Regular/Supplementary Examinations, January-2023
SIGNALS AND SYSTEMS
(Com to ECE, EIE, ECT)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions, each Question from each unit
All Questions carry **Equal** Marks

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UNIT-I

1 a) Determine whether the following signals are energy or power signals. [7M]
(i) $x(t) = \sin^2 \omega_0 t$ (ii) $x(t) = t\,u(t)$

b) Distinguish between Causal and Non-casual systems with an example. [7M]

OR

2 a) Explain about time shifting and scaling properties with an example. [7M]

b) Discuss briefly Orthogonality in complex functions. [7M]

UNIT-II

3 a) What is the Fourier transform of a rectangular pulse from t = -T/2 to t = T/2. [7M]

b) State and prove the time-convolution property of Fourier transform. [7M]

OR

4 a) Find the Fourier transforms of signal $x(t) = e^{-A(t)} \sin(t)$. [7M]

b) Show that the unit impulse function is the derivative of unit step function. [7M]

UNIT-III

5 a) Obtain the conditions for distortion less transmission through a system. [7M]

b) Discuss the concept of convolution in time domain and frequency domain. [7M]

OR

6 a) Write about filter characteristics of linear systems. [7M]

b) Find the convolution of two signals $x(t)= u(t-1) - u(t+1)$ and $h(t) = e^{-at} u(t)$, $a>0$. [7M]

UNIT-IV

7 a) Find the Nyquist rate and Nyquist interval for the signals [7M]
(a) rect (300t)
(b) 10 sin 40πt cos 300 πt

b) Explain the difference between Impulse, Natural and Top Sampling. [7M]

OR

8 a) Define power density spectrum and its properties. [7M]

b) Interpret about the sampling of band pass signals. [7M]
~~~~~~~~~~~~~~~~~~~~~~~~~~

UNIT-V

9 a) Define Laplace transform of signal x(t) and its region of convergence. [7M]

b) Find the Laplace transform of the following signal and its ROC. [7M]

$$x(t) = e^{-5t}\,[u(t) - u(t-5)]$$

OR

10 a) Distinguish between one-sided and two-sided z-transforms and its ROC. [7M]

b) Find the inverse z- transform of $x(z) = z/(z+2)(z-3)$ when the ROC is [7M]
i) ROC: $|z| < 2$ ii) ROC: $2 < |z| < 3$

Code No: R2021043 **R20** SET - 2

II B. Tech I Semester Regular/Supplementary Examinations, January-2023
SIGNALS AND SYSTEMS
(Com to ECE, EIE, ECT)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions, each Question from each unit
All Questions carry **Equal** Marks
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UNIT-I

1 a) Define and sketch the following signals: [7M]
i) Signum Function ii) Impulse function iii) Unit step function.
b) Determine the power and RMS value of the following signals: [7M]
$y(t) = 5\cos(50t + \pi/3)$, $y(t) = 10(\text{Cos}5t)(\text{Cos}10t)$

OR

2 a) Distinguish between the following: i) Continuous time signal and discrete time signal. ii) Unit step and Unit Ramp functions. iii) Periodic and Aperiodic Signals. [7M]
b) Explain the properties of unit impulse function. [7M]

UNIT-II

3 a) State and Prove Convolution property and Parseval's relation of Fourier series. [7M]
b) What is the difference between Fourier series Analysis and Fourier Transforms? Explain with an example. [7M]

OR

4 a) What is the significance of Hilbert Transform? Give the mathematical analysis. [7M]
b) Prove any two properties of Fourier transforms. [7M]

UNIT-III

5 a) What do you understand by distortedness transmission? Explain. [7M]
b) Discuss the Causality and Poly-Wiener criterion for physical realization. [7M]

OR

6 a) Derive the relationship between bandwidth and rise time. [7M]
b) Enlist the differences between LPF & HPF. [7M]

UNIT-IV

7 a) Discuss about the extraction of signal from noise by filtering. [7M]
b) Explain about the graphical and analytical proof for Band Limited Signals. [7M]

OR

|'''|'|'|''|'''|'|'||'|||
~~~~~~~~~~~~~~~~~~~~~~~~~~

8 a) Discuss briefly reconstruction of signal from its samples. [7M]
b) Obtain the relation between Convolution and correlation of the signals. [7M]

UNIT-V

9 a) Determine the Laplace transform of the following signal: $x_2(t) = te^{-t}\, u(t)$. [7M]
b) State and prove the initial-value theorem of Laplace transform. [7M]

OR

10 a) Determine z-transform, ROC and pole-zero locations of $x[n] = e^{jwon}\, u[n]$. [7M]
b) State and prove time convolution property of Z-transform. [7M]

II B. Tech I Semester Regular/Supplementary Examinations, January-2023
SIGNALS AND SYSTEMS
(Com to ECE, EIE, ECT)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions, each Question from each unit
All Questions carry **Equal** Marks
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UNIT-I

1 a) Write about elementary Continuous time Signals in Detail. [7M]

b) Determine whether the following function is periodic or not. If so find the period. $x(t)=3\sin 200\pi t + 4\cos 100t$. [7M]

OR

2 a) Derive the expression for Fourier Transform from Fourier Series. [7M]

b) Show that the unit impulse function is the derivative of unit step function. [7M]

UNIT-II

3 a) Find the Fourier transform of signum function. [7M]

b) Explain how the Fourier transform of a periodic signal can be obtained. [7M]

OR

4 a) Find the Hilbert transform of the signal $x(t)= \cos (2\pi t)$. [7M]

b) State and prove the time-scaling property of Fourier transform. [7M]

UNIT-III

5 a) Explain about Poly-Wiener criterion. [7M]

b) Obtain the convolution of the following two signals: $x(t) = e^{2t} u(t)$ and $h(t) = u(t-3)$. [7M]

OR

6 a) What is Impulse Response? Show that the response of an LTI system is convolution integral of its impulse Response with input signal? [7M]

b) Define rise time and bandwidth. Derive the relationship between them. [7M]

UNIT-IV

7 a) State and prove sampling theorem for low pass band limited signal and explain the process of reconstruction of the signal from its samples. [7M]

b) Discuss about Energy density spectrum with an example. [7M]

OR
~~~~~~~~~~~~~~~~~~~~~~~~~~

8 a) Explain about Auto-correlation and list its properties. [7M]

b) Determine the cross correlation between the two sequences x(n) = {1,0,01} and h(n) = { 4,3,2,1} [7M]

UNIT-V

9 a) Find the inverse Laplace transform of $F(s) = s{-}5/\ s\ (s{+}2)^2$ using Partial Fraction expansion. [7M]

b) Explain the concept of stability in S domain and What do you mean by region of convergence? [7M]

OR

10 a) State and prove the Convolution Property of Z -Transform. [7M]

b) Obtain the Z-transform of $x(n) = -a^n u(-n-1)$ and find its ROC. [7M]

Code No: R2021043 **R20** SET - 4

II B. Tech I Semester Regular/Supplementary Examinations, January-2023
SIGNALS AND SYSTEMS
(Com to ECE, EIE, ECT)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions, each Question from each unit
All Questions carry **Equal** Marks

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UNIT-I

1 a) What are the basic operations on signals? Illustrate with an example. [7M]

b) Define the error function while approximating signals and hence derive the expression for condition for orthogonality between two waveforms $f_1(t)$ and $f_2(t)$. [7M]

OR

2 a) Explain the properties of unit impulse function. [7M]

b) Determine whether the following signals are energy or power signals [7M]
(i) $x(t) = \sin^2 \omega_0 t$ (ii) $x(t) = t\, u(t)$.

UNIT-II

3 a) Find the Fourier Transform of f (t) = t cos (2t) using properties. [7M]

b) State and Prove Convolution property and Parseval's relation of Fourier series. [7M]

OR

4 a) State and prove Differentiation and integration properties of Fourier Transform. [7M]

b) What is the significance of Hilbert Transform? Give the mathematical analysis. [7M]

UNIT-III

5 a) Discuss the Graphical representation of convolution with an example. [7M]

b) Describe the different ideal filter characteristics of systems. [7M]

OR

6 a) Draw and explain the Ideal LPF characteristics of a signal. [7M]

b) A signal $x(t)= 2 \cos 400\pi t + 6 \cos 640\pi t$ is ideally sampled at fs = 500 Hz. If the sampled signal is passed through an ideal low pass filter with a cut off frequency of 400 Hz, what frequency components will appear in the output? [7M]

UNIT-IV

7 a) What is the effect of under sampling? Discuss different types of samplings. [7M]

b) Explain about Cross-correlation & list its properties. [7M]

OR
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8 a) Determine the Nyquist rate for $x(t) = 1 + \cos 2000\pi t + \sin 4000\pi t$. [7M]

b) Derive the relation between rise time and bandwidth of a low-pass filter. [7M]

UNIT-V

9 a) Explain the Time convolution and Scaling properties of Laplace transform. [7M]

b) State and prove final value theorem of Laplace transforms. [7M]

OR

10 a) Find the inverse of Z transform of $X(Z) = Z / (3Z^2 - 4Z+1)$. [7M]

b) State and prove time shifting and time convolution properties of z- transform. [7M]

Code No: R2021043 **R20** SET - 1

II B. Tech I Semester Supplementary Examinations, July - 2023
SIGNALS AND SYSTEMS
(Com to ECE, EIE, ECT)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions, each Question from each unit
All Questions carry **Equal** Marks
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UNIT-I

1 a) Define a signal? Give various classifications of signals and explain each classification. [7M]
b) Find the power and rms value of signal $x(t)=20Cos(2\pi t)$. [7M]

Or

2 a) Distinguish between [7M]
i) Linear and non linear systems
ii) Time variant and Time invariant systems
iii) Stable and Unstable systems.
b) Determine whether the following discrete -time signals are periodic or not? [7M]
(i) $Sin\ (0.002\pi n)$ (ii) $cos\ 4n$ (iii) $cos\ (\frac{\pi}{3} + 0.3n\ )$

UNIT-II

3 a) Define Fourier transform. Explain the properties of Fourier transform. [7M]
b) Find the trigonometric Fourier series expansion of a Half wave rectified cosine function with fundamental time period of 2π. [7M]

Or

4 a) Find the Fourier transform of $x(t) = u(2t)$, where $u(t)$ is the unit step function. [10M]
b) Explain Dirchlet's conditions and its significance to obtain Fourier series representation of any signal. [4M]

UNIT-III

5 a) Explain the filter characteristics of ideal LPF, HPF and BPF using their magnate and phase responses. [7M]
b) Obtain the impulse response of an LTI system defined by $dy(t)/dt + 2y(t) = x(t)$. Also obtain the response of this system when excited by $e^{-2t}u(t)$. [7M]

Or

6 a) What is the impulse response of two LTI systems connected in parallel? State the convolution Integral for CT LTI systems? [7M]
b) Explain the characteristics of ideal LPF and HPF. [7M]

UNIT-IV

7 a) Explain briefly detection of periodic signals in the presence of noise by correlation. [7M]
b) Explain the relation between convolution and correlation. [7M]

Or

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8 a) Prove that auto correlation function and energy/power spectral density function forms Fourier Transform pair. [7M]

b) Determine the autocorrelation function and energy spectral density function of $x(t) = e^{-at} u(t)$ [7M]

UNIT-V

9 a) Find the Laplace transform of the following signals: [7M]
(i) Impulse function, (ii) unit step function and ii) $A \, Sin\,(w_0 t)\, u(t)$

b) State the properties of ROC of Laplace Transform. [7M]

Or

10 a) State and prove the following properties of Z transform: (i) Time shifting, and (ii) Differentiation in z- domain [7M]

b) Distinguish between Fourier transform, Laplace transform and z transforms. [7M]