INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad-500043

ELECTRICAL AND ELECTRONICS ENGINEERING

TUTORIAL QUESTION BANK

Course Title	MICROCONTROLLER AND DIGITAL SIGNAL PROCESSING				
Course Code	AEC022				
Programme	B.Tech				
Semester	VI	EEE			
Course Type	Foundation				
Regulation	**IARE - R16**				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	3	2
Chief Coordinator	Ms.J.Sravana, Assistant Professor				
Course Faculty	Ms.J.Sravana, Assistant Professor				

COURSE OBJECTIVES:

	The course should enable the students to:
I	Enrich the knowledge of evolution of processor.
II	Apply the concept of assembly language programs for different applications.
III	Analyze and apply the concepts of discrete signals using discrete fourier transform.
IV	Analyze and design IIR and FIR digital filters.

COURSE OUTCOMES (COs):

CO 1	Apply a basic concept of digital fundamentals to Microprocessor based personal computer system
CO 2	Describe the architecture and instruction set of 8051 microcontroller
CO 3	Describe the architecture and instruction set of 8051 microcontroller and Design and implement 8051 microcontroller based systems
CO 4	Analyze the fundamentals and concepts in assess the effect of LTI systems on signals passing through them in frequency and time domains
CO 5	Discriminate the Fourier, Laplace and Z-transforms as appropriate for various signals and systems

COURSE LEARNING OUTCOMES (CLOs):

AEC022.01	Understand and Describe the evolution and basic architecture of 8086
AEC022.02	Describe the segmentation and programming model and List out the register organization
AEC022.03	Understand the difference between microprocessors and microcontrollers
AEC022.04	Understand and describe input/output ports of 8051 and register organization
AEC022.05	Describe different types of memory like special function register for program memory and data memory
AEC022.06	Describe the addressing modes of 8051 microcontroller
AEC022.07	Describe the instruction set of 8051 microcontroller
AEC022.08	Design assembly language program for 8051 based operations.
AEC022.09	Describe and illustrate the Timers/counters, serial communication
AEC022.10	Understand and Describe external memory
AEC022.11	Understand and Describe clock circuits and i/o memory
AEC022.12	Design assembly code for real time control.
AEC022.13	Design assembly code for real time control to interfacing ADC and DAC
AEC022.14	Understand the frequency domain representation and discrete Fourier transforms
AEC022.15	Understand the FFT and FFT algorithms, inverse FFT and FFT with general radix- N.
AEC022.16	Analyze and design of FIR digital filters
AEC022.17	Analyze and design of IIR filters and digital filters using window techniques

TUTORIAL QUESTION BANK

	UNIT- I			
MICROPROCESSORS AND MICROCONTROLLER				
Part - A (Short Answer Questions)				
S No	**QUESTIONS**	**Blooms Taxonomy Level**	**Course Outcomes**	**Course Learning Outcomes (CLOs)**
1	State Microprocessor and mention the power supply & clock frequency of 8086	Remember	CO 1	AEC022.01
2	List out few applications of microprocessor-based system.	Understand	CO 1	AEC022.01
3	Illustrate hardware interrupts in 8086	Remember	CO 1	AEC022.01
4	Describe about pipelining.	Remember	CO 1	AEC022.02
5	List out the general purpose registers of 8086.	Remember	CO 1	AEC022.03
6	List out the interrupts of 8086.	Remember	CO 1	AEC022.01
7	List out features of 8086 microprocessor.	Remember	CO 1	AEC022.02
8	List out the functional units of 8086 microprocessor	Remember	CO 1	AEC022.02
9	Illustrate the functions of an accumulator.	Remember	CO 1	AEC022.03
10	Illustrate why 8086 internal architecture is divided into BIU & EU?	Remember	CO 1	AEC022.01
11	Describe the functions of BIU.	Remember	CO 1	AEC022.02
12	Describe the functions of EU.	Remember	CO 1	AEC022.04
13	List out the special function registers of 8086.	Understand	CO 1	AEC022.03
14	Describe the flag register of 8086.	Understand	CO 1	AEC022.03
15	Describe how physical address is generated in 8086.	Remember	CO 1	AEC022.03
16	List out advantages of memory segmentation.	Understand	CO 1	AEC022.02
17	Evaluate the physical address, if base address is 5200H & offset address is 4510H.	Understand	CO 1	AEC022.02
18	Illustrate the physical memory organization of 8086.	Remember	CO 1	AEC022.03
19	List out the operating modes of 8086.	Understand	CO 1	AEC022.03
20	List out the minimum mode signals.	Remember	CO 1	AEC022.03
Part - B (Long Answer Questions)				
1	Describe the register set of 8051 and also Describe how memory and I/O addressing I s done in 8051.	Understand	CO 1	AEC022.04
2	Describe internal architecture of 8051 microcontroller in detail.	Understand	CO 1	AEC022.06
3	Describe the five addressing modes of 8051 microcontroller with example.	Understand	CO 1	AEC022.06
4	Sketch and illustrate how to access external memory devices In an 8051 based system.	Understand	CO 1	AEC022.04
5	Describe the internal memory organization of the 8051 microcontroller.	Understand	CO 1	AEC022.04
6	Design an 8051 based system with 16 K bytes of program ROM and 16 K bytes of data ROM.	Understand	CO 1	AEC022.05
7	Describe about the memory organization and special function registers in 8051 microcontroller.	Understand	CO 1	AEC022.06
8	Describe the operation of I/O ports in 8051 with neat sketch.	Understand	CO 1	AEC022.06
9	Demonstrate the functioning of A & B registers of 8051	Understand	CO 1	AEC022.04
10	List out the format of PSW register of 8051 and Illustrate each bit.	Understand	CO 1	AEC022.05
11	Describe the instructions formats of 8086.	Understand	CO 1	AEC022.04
12	Illustrate arithmetic instructions of 8086 examples.	Understand	CO 1	AEC022.05
13	Illustrate data transfer instructions of 8086 with examples.	Understand	CO 1	AEC022.06
14	Describe about the functions of the following pins. a)TEST b) RQ/GT0 & RQ/GT1 c) QS0 & QS1 d) S0,S1,S2	Understand	CO 1	AEC022.06
15	Illustrate minimum mode control signals of 8086.	Understand	CO 1	AEC022.04
16	Illustrate maximum mode control signals of 8086.	Understand	CO 1	AEC022.05
17	Illustrate the read & Design timing diagrams for minimum mode configuration.	Understand	CO 1	AEC022.04
18	Describe the interrupts of 8086.	Understand	CO 1	AEC022.05

19	Illustrate the architecture of 8086 with neat diagram.	Understand	CO 1	AEC022.06
20	Obtain the size of 8086 instruction queue and Illustrate how does queue speed up the processing.	Understand	CO 1	AEC022.06
	Part - C (Problem Solving and Critical Thinking Questions)			
1	Obtain an assembly language program to convert unpacked BCD to ASCII.	Understand	CO 1	AEC022.06
2	Obtain an assembly language program to convert ASCII to BCD.	Understand	CO 1	AEC022.06
3	Obtain a delay loop which produces a delay of 500µsec on an 8086 with 5-MHz clock.	Understand	CO 1	AEC022.04
4	Obtain 8051 program to OR the contents of port 1 and port 2, put the result in external RAM location 0102h	Understand	CO 1	AEC022.05
5	Generate a program in 8051 to count number of zero bits available in a byte vailable in external RAM at 1000h. Store zero bit count in internal RAM location 60H.	Understand	CO 1	AEC022.04
6	Design 8051 program to move a block of data from external program memoryto external data memory.	Understand	CO 1	AEC022.05
7	Obtain 8051 program to convert packed BCD number available in accumulator, into two ASCII numbers and save the min internal RAM locations 48H and 49H.	Understand	CO 1	AEC022.06
8	Describe which ports of 8051 are bit addressable and Illustrate how to assign ports.	Understand	CO 1	AEC022.06
9	Illustrate how many addresses can generate by 16 bit address bus.	Understand	CO 1	AEC022.06
10	Illustrate why Port 0 needs pull-up resistors. Illustrate how to assign ports.	Understand	CO 1	AEC022.06
	UNIT-II			
	INSTRUCTION SET AND PROGRAMMING OF 8051			
	Part – A (Short Answer Questions)			
1	List outare the addressing modes supported by 8051?	Understand	CO 2	AEC022.14
2	Describe the functions of the following signals of 8051? ALE/PROG	Understand	CO 2	AEC022.14
3	State XTAL1 and XTAL2	Understand	CO 2	AEC022.14
4	List outare register banks in 8051 microcontroller	Understand	CO 2	AEC022.14
5	List outare the addressing modes supported by 8051?	Remember	CO 2	AEC022.14
6	Describe the functions of the following signals of 8051? ALE/PROG, PSEN	Understand	CO 2	AEC022.14
7	Describe the functions of the following signals of 8051 PSEN	Remember	CO 2	AEC022.14
8	State index addressing modes of 8051	Understand	CO 2	AEC022.14
9	State direct addressing modes of 8051	Understand	CO 2	AEC022.14
10	State Immediate addressing modes of 8051	Understand	CO 2	AEC022.14
11	State resgister addressing modes of 8051	Remember	CO 2	AEC022.14
12	State resgister indirect addressing modes of 8051	Remember	CO 2	AEC022.14
13	State index addressing modes of 8051	Understand	CO 2	AEC022.14
14	State Data pointer	Understand	CO 2	AEC022.14
15	State the fuction of special function registers	Understand	CO 2	AEC022.14
16	Illustrate how the banks registers are selected using psw	Remember	CO 2	AEC022.14
17	State program status word	Remember	CO 2	AEC022.14
18	Obtain the internal memory of 8051	Remember	CO 2	AEC022.14
19	Illustrate the program memory and data memory	Remember	CO 2	AEC022.14
20	Illustrate about data pointer register	Remember	CO 2	AEC022.14
	Part - B (Long Answer Questions)			
1	Illustrate the addressing modes of 8051 microcontroller with examples	Understand	CO 2	AEC022.16
2	Describe the register set of 8051 Microcontroller with examples	Understand	CO 2	AEC022.14
3	Describe internal architecture of 8051 microcontroller in detail.	Understand	CO 2	AEC022.14
4	Design and illustrate how to access external memory devices in an 8051 based system.	Understand	CO 2	AEC022.16
5	Describe the operation of I/O ports in 8051 with neat Design.	Understand	CO 2	AEC022.16

6	Design the pin diagram of 8051 Microcontroller and Illustrate the Input /Output lines in detail	Understand	CO 2	AEC022.14
7	Illustrate the features of 8051 microcontroller and compare it with 8086 microprocessor. Design short notes on register set of 8051 micro controller	Understand	CO 2	AEC022.14
8	List out out the features of Special Function Registers of 8051 microcontroller	Understand	CO 2	AEC022.16
9	Design and Illustrate the functions of bits in tmod registers of 8051	Understand	CO 2	AEC022.16
10	Illustrate the interfacing of external memory to 8051	Understand	CO 2	AEC022.14
11	Illustrate the instruction set of 8051 microcontroller with examples	Understand	CO 2	AEC022.14
12	Design and Illustrate the functions of bits in tcon registers of 8051	Understand	CO 2	AEC022.16
13	Illustrate the multiplication instruction set of 8051 microcontroller with examples	Understand	CO 2	AEC022.16
14	Illustrate the division instruction set of 8051 microcontroller with examples	Understand	CO 2	AEC022.14
15	Illustrate the machine control instruction set of 8051 microcontroller with examples	Understand	CO 2	AEC022.14
16	Illustrate the interfacing of external memory to ram of 8051	Understand	CO 2	AEC022.16
17	Illustrate the interfacing of external memory to rom of 8051	Understand	CO 2	AEC022.14
18	Illustrate the interfacing of external memory to rom of 8051	Understand	CO 2	AEC022.14
19	Describe the operation of I/O ports like port 0,1 ,2,3 in 8051 with neat sketch.	Understand	CO 2	AEC022.16
20	Illustrate how port address is assigned of I/O ports in 8051	Understand	CO 2	AEC022.16
Part - C (Problem Solving and Critical Thinking Questions)				
1	Design 8051 program to convert packed BCD number available in accumulator, into two ASCII numbers and save them in internal RAM locations 48H and 49H .	Understand	CO 2	AEC022.16
2	Design 8051 program to move a block of data from external program memoryto external data memory.	Understand	CO 2	AEC022.16
3	Develop a PUSH instruction to put the number 82H in RAM locations 34H to 37H. Also Design same program without PUSH instruction.	Understand	CO 2	AEC022.16
4	Develop a program in 8051 to count number of zero bits available in a byte available in external RAM at 1000h. Store zero bit count in internal RAM location 60H.	Understand	CO 2	AEC022.16
5	Illustrate how 8051 distinguishes between internal and external ROMs	Understand	CO 2	AEC022.20
6	Design a program to Calculate the average of five 8 bit numbers. Store the result in 55 H	Understand	CO 2	AEC022.17
7	Generate a program to increment the ten 8 bit numbers stored in internal data memory from location 50 H	Understand	CO 2	AEC022.17
8	Design 8051 program to move a string of data from external program memory to external data memory.	Understand	CO 2	AEC022.16
9	Design a program to Calculate even number in a given 8 bit numbers. Store the result in 55 H	Understand	CO 2	AEC022.16
10	Design a program for multiplication using data pointer assign 16 bit address location.	Understand	CO 2	AEC022.16
UNIT -III				
8051 MICRO CONTROLLER DESIGN				
Part - A (Short Answer Questions)				
1	Describe the clock source for the timers —	Remember	CO 3	AEC022.02
2	Illustrate the use of EA bit.	Remember	CO 3	AEC022.02
3	Describe the function of the TMOD register.	Understand	CO 3	AEC022.03
4	Illustrate the maximum delay that can be generated with the crystal frequency of 22MHz.	Remember	CO 3	AEC022.01
5	Illustrate auto reload mode is allowed in which mode of the timer.	Remember	CO 3	AEC022.02
6	List out the roll over value for the timer in Mode 0, Mode 1 and Mode 2.	Understand	CO 3	AEC022.04

7	Describe State steps are followed when we need to turn on any timer.	Understand	CO 3	AEC022.03
8	Describe if Timer 0 is to be used as a counter, then at State particular pin clock pulse need to be applied.	Remember	CO 3	AEC022.03
9	Describe in the instruction “MOV TH1,#-3”, State is the value that is being loaded in the TH1 register ?	Remember	CO 3	AEC022.03
10	Estimate the counting rate of a machine cycle in correlation to the oscillator frequency for timers.	Remember	CO 3	AEC022.02
	CIE-II			
11	Illustrate Which special function register play a vital role in the timer/counter mode selection process by allocating the bits in it.	Understand	CO 3	AEC022.05
12	Describe how many machine cycle/s is / are executed by the Counters in 8051 in order to detect '1' to '0' transition at the external pin.	Remember	CO 3	AEC022.03
13	Classify the types of communication with examples.	Remember	CO 3	AEC022.03
14	List out the contents of the IE register, when the interrupt of the memory location 0x00 is caused?	Understand	CO 3	AEC022.03
15	Illustrate which pin of the external hardware is said to exhibit INT0 interrupt.	Understand	CO 3	AEC022.02
16	Enlist which bit of the IE register is used to enable TxD/RxD interrupt.	Remember	CO 3	AEC022.02
17	Describe which register is used to make the pulse a level or a edge triggered pulse.	Remember	CO 3	AEC022.03
18	Classify the external interrupts of 8051.	Remember	CO 3	AEC022.01
19	Describe which bits are control the external interrupts.	Understand	CO 3	AEC022.02
20	Differentiate serial and parallel communication.	Remember	CO 3	AEC022.04
	Part - B (Long Answer Questions)			
1	Illustrate the register IE format of 8051	Understand	CO 3	AEC022.03
2	Classify the interrupt sources of 8051?	Understand	CO 3	AEC022.02
3	Illustrate about interrupt priority (IP).	Remember	CO 3	AEC022.02
4	Illustrate about PCON operation with an example.	Remember	CO 3	AEC022.03
5	Describe the vector address and priority sequence of 8051 interrupts.	Remember	CO 3	AEC022.01
6	Illustrate the timers/counters in 8051.	Understand	CO 3	AEC022.02
7	Describe about timer/counter modes operation.	Remember	CO 3	AEC022.04
8	Illustrate TMOD operation with an example.	Remember	CO 3	AEC022.03
9	State the standards of serial communication.	Understand	CO 3	AEC022.02
10	Classify the types of serial communication with examples.	Understand	CO 3	AEC022.02
	CIE-II			
11	Illustrate the register IE format of 8051	Remember	CO 3	AEC022.03
12	Classify the interrupt sources of 8051?	Remember	CO 3	AEC022.01
13	Illustrate about TCON operation with an example.	Remember	CO 3	AEC022.02
14	Classify the internal interrupt sources of 8051?	Understand	CO 3	AEC022.04
15	State are the ways of serial communication in 8051	Understand	CO 3	AEC022.03
16	Illustrate the interfacing of 8051 with ports ?	Understand	CO 3	AEC022.02
17	Illustrate the timer operations in different modes for 8051	Remember	CO 3	AEC022.02
18	Illustrate the counter modes operations for 8051	Remember	CO 3	AEC022.03
19	Illustrate how th nd tl of timer can be selected and operated with example	Remember	CO 3	AEC022.01
20	Illustrate which pin of the external hardware is said to exhibit INT0 and INT1 interrupt.	Understand	CO 3	AEC022.02
	Part – C (Problem Solving and Critical Thinking)			
1	Design an assembly language program to interface serial communication of 8051	Understand	CO 3	AEC022.06

2	Design program to transmit a character say 'A' continuously based on interrupt. The microcontroller uses a clock of 12MHz with a baud rate of 1202. The program is executed following a hardware reset.	Understand	CO 3	AEC022.06
3	Design an assembly language program to exchange the content of FFh and FF00h.	Remember	CO 3	AEC022.04
4	Design a program instruction to load a byte in a memory location 9000H and increment the content of the memory location.	Remember	CO 3	AEC022.05
5	Design an assembly language program for interfacing keyboard interfacing by 8051	Remember	CO 3	AEC022.06
	CIE-II			
6	Design an assembly language program for interfacing using adc converter by 8051	Understand	CO 3	AEC022.06
7	Design an assembly language program for interfacing using dac converter by 8051	Understand	CO 3	AEC022.06
8	Design an assembly language program for interfacing using LED converter by 8051	Understand	CO 3	AEC022.06
9	Design an assembly language program for interfacing using 7 segment converter by 8051	Remember	CO 3	AEC022.04
10	Design an assembly language program for interfacing using buzzer converter by 8051	Remember	CO 3	AEC022.05
	UNIT - IV			
	INTRODUCTION TO DIGITAL SIGNAL PROCESSING AND FAST FOURIER TRANSFORMS			
	Part - A (Short Answer Questions)			
1	State symmetric and anti symmetric signals.	Understand	CO 4	AEC022.14
2	Illustrate about impulse response?	Understand	CO 4	AEC022.14
3	Describe an LTI system?	Remember	CO 4	AEC022.14
4	List out the operations performed on the signals.	Remember	CO 4	AEC022.14
5	Describe the condition for causality and stability?	Remember	CO 4	AEC022.14
6	State the Sampling Theorem	Understand	CO 4	AEC022.14
7	State and sketch the graphical representations of a unit impulse, step	Understand	CO 4	AEC022.13
8	List out the Applications of DSP?	Understand	CO 4	AEC022.14
9	State the causal system.	Remember	CO 4	AEC022.15
10	Describe the advantages of DSP?	Remember	CO 4	AEC022.13
11	Illustrate about energy and power signals?	Understand	CO 4	AEC022.13
12	State the condition for BIBO stable?	Understand	CO 4	AEC022.13
13	State Time invariant system.	Remember	CO 4	AEC022.13
14	State Time variant system.	Remember	CO 4	AEC022.13
15	State the non- causal system.	Remember	CO 4	AEC022.13
16	Describe about memory and memory less system?	Understand	CO 4	AEC022.13
17	Design a discrete time signal x(n) =4 δ (n+4) + δ(n)+ 2 δ (n-1) + δ (n-2)	Understand	CO 4	AEC022.13
18	Illustrate linear system in the following: a) $y(n)=e^{x(n)}$ b) $y(n)=x^2(n)$ c) $y(n)=ax(n)+b$ d) $y(n)=x(n^2)$	Understand	CO 4	AEC022.13
19	Sate the basic building blocks of realization structures?	Remember	CO 4	AEC022.14
20	State canonic and non-canonic structures.	Remember	CO 4	
21	State the main advantage of direct-form II realization when compared to Direct-form I realization?	Remember	CO 4	
22	Illustrate a time-variant system. a) $y(n)=e^{x(n)\square 2}$ b) $y(n)=x(n)$ c) $y(n)=x(n)-x(n-1)$ d) $y(n)=nx(n)$	Understand	CO 4	AEC022.13

23	Illustrate a causal system. a) $y(n) = x(2n)$ b) $y(n) = x(n) - x(n-1)$ c) $y(n) = nx(n)$ d) $y(n) = x(n) + x(n+1)$	Understand	CO 4	AEC022.14
24	State is advantage of cascade realization	Remember	CO 4	AEC022.13
25	Design the parallel form structure of IIR filter	Remember	CO 4	AEC022.14
26	Design the cascade form structure of IIR filter	Remember	CO 4	AEC022.13
27	State Transfer function for IIR Filters	Understand	CO 4	AEC022.14
28	State Transfer function for FIR Filters	Understand	CO 4	AEC022.13
29	State Z-transform and region of converges.	Understand	CO 4	AEC022.14
30	Develop the Z-transform of the finite-duration signal x(n)={1,2,5,7,0,1}	Remember	CO 4	AEC022.13
	Part - B (Long Answer Questions)			
1	Describe on stability and Determine the impulse response and step response of the causal system given below y(n) + y(n–1) – 2y(n–2) = x(n–1)+2x(n–2)	Understand	CO 4	AEC022.14
2	Develop the following systems for linearity, time invariance, causality and stability. i.y(n) = a|x(n)| ii.y(n) = sin(2nfn/F) x(n)	Understand	CO 4	AEC022.14
3	Develop the impulse response for the causal system y(n)-y(n-1) = x(n)+x(n-1)	Remember	CO 4	AEC022.14
4	State whether the following system is invariant y(n)= log10 |x (n)| Justify	Remember	CO 4	AEC022.14
5	State stable and unstable system test the condition for stability of the first-order system governed by the equation y(n)=x(n)+bx(n-1).	Understand	CO 4	AEC022.14
6	Determine it s unit sample response h(n). A system is described by the difference equation y(n)-y(n-1)-y(n-2) = x(n-1). Assuming that the system is initially relaxed,	Understand	CO 4	AEC022.14
7	Determine the impulse response and the unit step response of the systems Described by the difference equation y(n) = 0.6y(n-1)-0.08 y(n-2) + x(n).	Understand	CO 4	AEC022.14
8	Determine the response of the system if input is x(n)={1 2 31} The impulse response of LTI system is h(n)={1 2 1-1}	Understand	CO 4	AEC022.14
9	Determine the output y(n) of LTI system with impulse response h(n)= a^n u(n). |a|<1 When the input is unit input sequence that is x(n)=u(n)	Remember	CO 4	AEC022.14
10	Determine the output y(n) of LTI system with impulse response h(n)= a^n u(n). |a|<1 When the input is unit input sequence that is x(n)=u(n)	Remember	CO 4	AEC022.13
11	Determine impulse response for cascade of two LTI systems having Impulse responses of $H_1(n)=(1/2)^n u(n)$ $H_2(n)=(1/4)^n u(n)$	Understand		AEC022.13
12	Develop the Discrete convolution for the following sequence u(n)*u(n-3)	Understand	CO 4	AEC022.14
13	Determine the stability of the system Y(n)-(5/2)y(n-1)+y(n-2)=x(n)-x(n-1)	Remember	CO 4	AEC022.14
14	Calculate the response of the following difference equation y(n)-5y(n-1)+6y(n-2)=x(n) for x(n)=n	Understand	CO 4	AEC022.14
15	Calculate the inverse a-transform of X(z)= $\frac{z(z+1)}{(z-2)(z-1)^2}$ roc |z|>2using partial fraction method.	Understand	CO 4	AEC022.14
16	Determine the convolution of the pairs of signals by means of z-transform $X_1(n)=(1/2)^n$ u(n), $X_2(n)=\cos\pi n$ u(n)	Understand	CO 4	AEC022.14
17	Obtain the cascade and parallel form realizations for the following systems Y (n) = -0.1(n-1) + 0.2 y (n-2) + 3x (n) +3.6 x (n-1) +0.6 x (n-2)	Understand	CO 4	AEC022.14
18	Obtain the Direct form II y (n) = -0.1(n-1) + 0.72 y(n-2) + 0.7x(n) -0.252 x(n-2)	Remember	CO 4	AEC022.14

19	Calculatethe direct form- II realization of H (z) =8z-2+5z-1+1 / 7z-3+8z-2+1	Remember	CO 4	AEC022.14
20	Obtain the i) Direct forms ii) cascade iii) parallel form realizations for the following systems y (n) = 3/4(n-1) – 1/8 y(n-2) + x(n) +1/3 x(n-1)	Understand	CO 4	AEC022.14
21	Calculatethe output y(n) of a filter whose impulse response is h(n) = {1 1 1} and input signal x(n) = {3 -1 0 1 3 2 0 1 2 1}. Using overlap save method	Understand	CO 4	AEC022.13
22	Calculatethe output y(n) of a filter whose impulse response is h(n) = {1 11} and input signal x(n) = {3 -1 0 1 3 2 0 1 2 1}. Using Overlap add method	Remember	CO 4	AEC022.13
	Part – C (Problem Solving and Critical Thinking)			
1	Determine the range of a‟ for which the system is stable Given the impulse response of a system as h(k)=a^ku(k)	Understand	CO 4	AEC022.14
2	Determine the transfer function and impulse response of the system $y(n) - \frac{1}{8}y(n-1) + \frac{1}{8}y(n-2) = x(n) + x(n-1)$.	Understand	CO 4	AEC022.14
3	Obtain the i) Direct forms ii) parallel form realizations for the following systems y (n) = x(n) +1/3 x(n-1)-1/5 x(n-2)	Remember	CO 4	AEC022.14
4	Determine the range of „a‟ and „b‟for which the system is stable with impulse response H(n)= a^n n≥0 b^n n<0	Remember	CO 4	AEC022.14
5	Determine y(n) n ≥ 0 in the following cases Use the one-sided Z-transform to. (a) y(n) +y(n−1)−0.25y(n−2) = 0; y(−1) = y(−2) = 1	Understand	CO 4	AEC022.14
6	Obtain the i) Direct forms ii) cascade iii) parallel form realizations for the following systems y (n) = 3/4(n-1) – 1/8 y(n-2) + x(n) +1/3 x(n-1)	Understand	CO 4	AEC022.13
7	Calculatethe direct form –I cascade and parallel form for H(Z) = z^{-1} -1 / 1 – 0.5 z^{-1}+0.06 z^{-2}	Remember	CO 4	AEC022.13
8	Determine y(n) n ≥ 0 in the following cases. y(n)−1.5y(n−1) +0.5y(n−2) = 0; y(−1) = 1; y(−2) = 0	Understand	CO 4	AEC022.14
9	Calculate the output y(n) of a filter whose impulse response is h(n) = {1 2 1} and input signal x(n) = {3 -1 0 1 3 2 0 1 2 1}. Using overlap save method	Understand	CO 4	AEC022.14
10	Calculate the Discrete convolution for the following sequence u(n)*u(n-2)	Remember	CO 4	AEC022.14
	UNIT - V			
	IIR AND FIR DIGITAL FILTERS			
	Part - A (Short Answer Questions)			
1	State FIR filter? And State are advantages of FIR filter?	Remember	CO 5	AEC022.13
2	State the necessary and sufficient condition for the linear phase characteristic of a FIR filter?	Understand	CO 5	AEC022.13
3	List out the well known design technique for linear phase FIR filter design?	Understand	CO 5	AEC022.13
4	State are disadvantages of FIR filter?	Understand	CO 5	AEC022.13
5	Determine Under State conditions a finite duration sequence h(n) will yield constant group delay in its frequency response characteristics and not the phase delay?	Understand	CO 5	AEC022.13
6	State Gibbs phenomenon?	Remember	CO 5	AEC022.13
7	State the desirable characteristics of the windows?	Remember	CO 5	AEC022.13
8	Compare Hamming window with Kaiser window.	Remember	CO 5	AEC022.13
9	Design impulse response of an ideal lowpass filter.	Remember	CO 5	AEC022.13
10	State is the principle of designing FIR filter using frequency sampling method?	Remember	CO 5	AEC022.13
11	State type of filters frequency sampling method is suitable?	Understand	CO 5	AEC022.13
12	State is the effect of truncating an infinite Fourier series into a finite series	Remember	CO 5	AEC022.13
13	Narrate FIR filters are always stable?	Remember	CO 5	AEC022.13
14	Illustrate the procedure for designing FIR filters using windows.	Remember	CO 5	AEC022.13

15	State the disadvantage of Fourier series method ?	Remember	CO 5	AEC022.13
16	Design the frequency response of N point Bartlett window	Remember	CO 5	AEC022.13
17	Design the frequency response of N point Blackman window	Understand	CO 5	AEC022.13
18	Design the frequency response of N point Hanning window	Remember	CO 5	AEC022.13
19	State the necessary and sufficient condition for linear phase characteristics in FIR filter.	Remember	CO 5	AEC022.13
20	Express the equation specifying Kaiser window.	Remember	CO 5	AEC022.13
21	State Kaiser window? In State way is it superior to other window functions?	Remember	CO 5	AEC022.13
	Part - B (Long Answer Questions)			
1	Compare IIR and FIR filters	Remember	CO 5	AEC022.13
2	Design an ideal h pass filter with a fr uency respose Hd(ejw)=1 for ≤| ω |≤π0 for | ω |≤ Calculatethe values of h(n) for N=11.CalculateH(z).plot magnitude response.	Understand	CO 5	AEC022.13
3	Design an ideal band r ct filter with equency respose Hd(ejw)=1 for | ω |≤ and | ω |≥ 0 for otherwise Calculatethe values of h(n) for N=11.CalculateH(z).plot magnitude response.	Understand	CO 5	AEC022.13
4	Design an ideal differentiator H(ejw)=j ω -π≤ ω≤π Using a) rectangular window b)Hamming window with N=8.plot frequency response in both cases.	Remember	CO 5	AEC022.13
5	State are the important features of FIR filter and Illustrate advantages and disadvantages of FIR filters over IIR flters	Understand	CO 5	AEC022.13
6	Determine the frequency response of FIR filter Stated by y(n)=0.25x(n)+x(n-1)+.25x(n-2) Calculate the phase delay and group delay.	Understand	CO 5	AEC022.13
7	Illustrate the need for the use of window sequences in the design of FIR filter. Describe the window sequences generally used and compare their properties.	Remember	CO 5	AEC022.13
8	Design an ideal h pass filter with a fr uency respose Hd(ejw)=1 for ≤| ω |≤π0 for | ω |≤ Calculatethe values of h(n) for N=11.CalculateH(z).plot magnitude response.	Understand	CO 5	AEC022.13
9	Prove that an FIR filter has linear phase if the unit sample response satisfies the condition h(n)= ±h(M-1-n), n=0,1,….M-1. Also Describe symmetric and antisymmetric cases of FIR filter	Understand	CO 5	AEC022.13
10	Using a rectangular window technique design a low pass filter with pass band gain of unity, cutoff frequency of 100Hz and working at a sampling frequency of 5 KHz.The length of the impulse response should be7.	Remember	CO 5	AEC022.13
11	Design a HPF of length 7 with cut off frequency of 2 rad/sec using Hamming window. Plot the magnitude and phase response.	Understand	CO 5	AEC022.13
12	Illustrate the principle and procedure for designing FIR filter using rectangular window	Understand	CO 5	AEC022.13
13	Design a high pass filter using hamming window with a cut-off frequency of 1.2radians/second and N=9	Remember	CO 5	AEC022.13
14	Illustrate optimized design of FIR filter using Parks-McClellan remez algorithm and its limitations.	Understand	CO 5	AEC022.13
15	Illustrate optimized design of FIR filter using least mean square error method.	Understand	CO 5	AEC022.13
16	Design a tenth order FIR band pass digital filter with lower and upper cut-off frequencies at π/8 and π/3 respectively.	Remember	CO 5	AEC022.13
17	Describe the window sequence generally used and compare the properties.	Understand	CO 5	AEC022.13
18	Illustrate the need for the use of window sequence in the design of FIR filter.	Understand	CO 5	AEC022.13
19	Design a tenth order FIR band pass digital filter with lower and upper cut-off frequencies at π/3 respectively.	Remember	CO 5	AEC022.13
20	Design a high pass filter using hamming window with a cut-off frequency of 1.2radians/second and N=8	Understand	CO 5	AEC022.13

Part – C (Problem Solving and Critical Thinking)				
1	Prove for an FIR filter has linear phase if the unit sample response satisfies the condition h(n)= ± h(M-1-n), n =0,1,….. M-Also Describe symmetric and anti symmetric cases of FIR filter.	Understand	CO 5	AEC022.13
2	Prove for a linear phase filter, its impulse-response must be symmetric about n=N for some N, (i.e. h[N + n] = h[N-n] for all n), why cannot an IIR filter belinear phase?	Understand	CO 5	AEC022.13
3	Design an ideal Hilbert transformer having frequency responseH (e jώ) = j -π ≤ ω ≤ 0 -j 0 ≤ ω ≤ π for N=11 using rectangular window	Remember	CO 5	AEC022.13
4	Determine the filter coefficients for N=7 Using frequency sampling method design a band pass filter with following specifications Sampling frequency F=8000Hz Cut off frequency fc1=1000Hz fc2=3000Hz	Understand	CO 5	AEC022.13
6	Design an FIR low pass digital filter using the frequency sampling method for the following specifications (16) Cut off frequency = 1500Hz Sampling frequency = 15000Hz Order of the filter N = 10 Filter Length require d L = N+1 = 11	Understand	CO 5	AEC022.13
7	Design the first 15 coefficients of FIR filters of magnitude specification is given below $H(e^{jw})$ =1, -π/2≤ ω≤π/2 0, otherwise	Remember	CO 5	AEC022.13
8	Design a FIR linear phase digital filter approximating the ideal frequency response hd(w)=1; |w|< π/6 = π/6<|w|< π With T=1 Sec using bilinear transformation .Realize the same in Direct form II	Understand	CO 5	AEC022.13
9	Design a lowpass filter with pass band gain of unity, cutoff frequency of 1000 Hz and working at a sampling frequency of 5 kHz. The length of the impulse response should be 7	Understand	CO 5	AEC022.13
10	Design a filter with Hd(ejώ) = e- 3 jώ, π/4 ≤ ω ≤ π/4 =0 for π/4 ≤ ω ≤ π using a Hamming window with N=7.	Understand	CO 5	AEC022.13

Prepared By
J.Sravana, Assistant professor

HOD,EEE