INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal, Hyderabad - 500 043

COMPUTER SCIENCE AND ENGINEERING

TUTORIAL QUESTION BANK

Course Title	COMPUTER ORGANIZATION AND ARCHITECTURE				
Course Code	ACSB07				
Programme	B.Tech				
Semester	IV	CSE / IT			
Course Type	Core				
Regulation	IARE - R18				
Course Structure	**Theory**			**Practical**	
	Lectures	Tutorials	Credits	Laboratory	Credits
	3	-	3	-	-
Chief Coordinator	Mr. E Sunil Reddy, Assistant Professor				
Course Faculty	Dr. P.L.SrinivasaMurthy,Professor Mr. N Rajasekhar, AssistantProfessor Ms. B.DhanaLaxmi, Assistant Professor				

COURSE OBJECTIVES:

The course should enable the students to:

S.No	Description
I	Understand the organization and architecture of computer systems and electronic computers.
II	Study the assembly language program execution, instruction format and instruction cycle.
III	Design a simple computer using hardwired and micro programmed control methods.
IV	Study the basic components of computer systems besides the computer arithmetic.
V	Understand input-output organization, memory organization and management, and pipelining.

COURSE OUTCOMES:

The course should enable the students to:

CO 1	Understand the organization and levels of design in computer architecture
CO 2	Ability to learn the concepts of instruction set formats
CO 3	To understand the concepts of programming methodologies
CO 4	Ability to learn virtual memory concept with page replacement concept in memory organization
CO 5	Understand the different priority interrupts in the input-output organization in the computer architecture.

COURSE LEARNING OUTCOMES:
Students, who complete the course, will have demonstrated the ability to do the following:

ACSB07.01	Describe the various components like input/output units, memory unit, control unit, arithmetic logic unit connected in the basic organization of a computer.
ACSB07.02	Understand the interfacing concept with memory subsystem organization and input/output subsystem organization.
ACSB07.03	Understand instruction types, addressing modes and their formats in the assembly language programs.
ACSB07.04	Describe the instruction set architecture design for relatively simple microprocessor or Central Processing Unit.
ACSB07.05	Classify the functionalities of various micro operations such as arithmetic, logic and shift micro operations.
ACSB07.06	Understand the register transfer languages and micro operations involved in bus and memory transfers.
ACSB07.07	Describe the design of control unit with address sequencing and microprogramming Concepts.
ACSB07.08	Understand the connections among the circuits and the functionalities in the hardwired control unit.
ACSB07.09	Describe the various phases involved in the instruction cycle viz. fetching, decoding, reading effective address and execution of instruction.
ACSB07.10	Describe various data representations and explain how arithmetic and logical operations are performed by computers.
ACSB07.11	Classify the various instructions formats to solve the arithmetic expressions in different addressing modes.
ACSB07.12	Understand the functionality of various instruction formats for writing assembly language programs.
ACSB07.13	Describe the implementation of fixed point and floating point addition, subtraction operations.
ACSB07.14	Understand the concept of memory hierarchy and different typed of memory chips.
ACSB07.15	Describe various modes of data transfer between CPU and I/O devices
ACSB07.16	Understand the virtual memory concept with page replacement concept in memory organization
ACSB07.17	Describe the hardware organization of associate memory and understand the read and write operations
ACSB07.18	Describe the parallel processing concept with multiple functional units.
ACSB07.19	Understand the multiprocessor concept with system bus structure and the concept of inter processor communication and synchronization
ACSB07.20	Understand the different priority interrupts in the input-output organization in the computer architecture
ACSB07.21	Possess the knowledge and skills for employability and to succeed in national and international level competitive examinations.
ACSB07.22	Possess the knowledge and skills to design advanced computer architecture for current industry requirements.

TUTORIAL QUESTION BANK

S. No	QUESTIONS	Bloom's Taxonomy Level	Course outcomes	Course Learning Outcomes
MODULE – I			
INTRODUCTION TO COMPUTER ORGANIZATION			
Part - A (Short Answer Questions)			
1	Define Computer Architecture.	Remember	CO1	ACSB07.04
2	Define Computer organization.	Remember	CO1	ACSB07.01
3	List the types of computers	Remember	CO1	ACSB07.01
4	Explain the functional units of a computer	Understand	CO1	ACSB07.01
5	Explain the types of memory.	Understand	CO1	ACSB07.02
6	Explain about Arithmetic And Logic Unit.	Remember	CO1	ACSB07.02
7	Define instruction cycle.	Remember	CO1	ACSB07.03
8	Explain about central processing unit	Understand	CO1	ACSB07.04
9	Define different memory chips.	Understand	CO1	ACSB07.02
10	Differentiate between the static and dynamic RAMs.	Understand	CO1	ACSB07.02
11	List out the Levels of programming languages.	Remember	CO1	ACSB07.03
12	Explain Instruction formats	Understand	CO1	ACSB07.03
13	Explain about Instruction set architecture (ISA) design	Remember	CO1	ACSB07.04
14	Explain about the data transfer instructions	Understand	CO1	ACSB07.03
15	Explain number Systems in computer organization.	Remember	CO1	ACSB07.01
Part - B (Long Answer Questions)			
1	Describe the basic instruction types in assembly language programming.	Understand	CO1	ACSB07.03
2	Give the control sequence for execution of instruction.	Remember	CO1	ACSB07.03
3	With a general block diagram, explain the functions of the processor registers.	Understand	CO1	ACSB07.01
4	Describe the connection between inside the processor; explain the functions of Each component?	Remember	CO1	ACSB07.02
5	Describe the Basic Computer Organization.	Understand	CO1	ACSB07.01
6	Explain in detail about the instruction cycle.	Remember	CO1	ACSB07.03
7	Describe the Input-output subsystem organization and interfacing.	Understand	CO1	ACSB07.02
8	Explain important steps for computer design.	Remember	CO1	ACSB07.02
9	Describe the different types of fields that are part of an instruction.	Understand	CO1	ACSB07.02
10	Describe the basic components of a Microprocessor.	Remember	CO1	ACSB07.02
11	Describe different types of interrupts in a microprocessor system.	Understand	CO1	ACSB07.03
12	Differentiate between the different kinds of ROMs.	Remember	CO1	ACSB07.04
13	Define the terms 'stack' and 'subroutine'. How are they useful in implementation of architecture of a processor.	Understand	CO1	ACSB07.03
14	Explain Computer Architecture with diagram.	Remember	CO1	ACSB07.03
15	Describe the difference between computer architecture and computer organization.	Remember	CO1	ACSB07.03
MODULE– II			
ORGANIZATION OF A COMPUTER			
Part - A (Short Answer Questions)			
1	Define the register transfer language?	Remember	CO2	ACSB07.05
2	Define bus and memory transfer?	Understand	CO2	ACSB07.05
3	Describe the different arithmetic micro operations.	Remember	CO2	ACSB07.06
4	Explain the different logical micro operations.	Understand	CO2	ACSB07.06
5	State the different shift micro operations	Remember	CO2	ACSB07.06
6	Explain about the control circuitry?	Understand	CO2	ACSB07.08
7	Describe tri state buffer with their application	Remember	CO2	ACSB07.05
8	State control word and control address register in control memory.	Remember	CO2	ACSB07.08

9	Summarize mapping process in address sequencing	Understand	CO2	ACSB07.06
10	Describe branch logic in address sequencing	Remember	CO2	ACSB07.06
11	Evaluate instruction format	Understand	CO2	ACSB07.07
12	Enumerate micro operations in micro program example	Remember	CO2	ACSB07.07
13	Describe fetching and decoding.	Understand	CO2	ACSB07.07
14	State what is meant by full adder	Remember	CO2	ACSB07.07

Part - B (Long Answer Questions)

1	Evaluate Register Transfer Language(RTL) and Demonstrate with examples.	Remember	CO2	ACSB07.05
2	Describe the common bus system using multiplexers with a neat design.	Understand	CO2	ACSB07.06
3	Enumerate Micro-operation. Illustrate about Arithmetic micro-operations with examples.	Remember	CO2	ACSB07.06
4	Illustrate 4-bit Binary Adder-subtractor along with Neat Design.	Understand	CO2	ACSB07.06
5	State Binary adder and 4-bit Binary Adder along with Neat Design	Remember	CO2	ACSB07.06
6	Evaluate 4-bit Binary Incrementer and along with Neat Design.	Remember	CO2	ACSB07.06
9	State Logic Micro-operations and Explain one stage of logic circuit along with Functional table.	Understand	CO2	ACSB07.08
10	Describe Shift Micro operations and Explain 4-bit Combinational circuit shifter.	Remember	CO2	ACSB07.07
11	Illustrate control memory and design micro programmed control organization	Understand	CO2	ACSB07.08
12	Evaluate Address sequencing and conditional branching along with Design selection of address for control memory.	Understand	CO2	ACSB07.08
13	Describe mapping of instruction and subroutine in Address sequencing.	Remember	CO2	ACSB07.07
14	Enumerate Microprogram example and design a computer hardware configuration	Understand	CO2	ACSB07.08
15	Evaluate microinstruction format and fetch routine in the Microprogram example.	Remember	CO2	ACSB07.07

Part - C (Problem Solving and Critical Thinking Questions)

1	Summarize the selection of address for control memory in micro programmed control unit	Understand	CO2	ACSB07.08
2	Design the 4-bit arithmetic circuit for arithmetic micro operations.	Remember	CO2	ACSB07.07
3	Describe the micro instruction format in detail.	Understand	CO2	ACSB07.08
4	Enumerate the need of subroutine register in a control unit? Explain.	Remember	CO2	ACSB07.07
5	Describe the need of some bits of current microinstruction to generate address of the next microinstruction	Understand	CO2	ACSB07.06
6	Illustrate the mapping from micro-operation to a micro instruction address?	Remember	CO2	ACSB07.07

MODULE– III

CPU AND COMPUTER ARITHMETIC

Part - A (Short Answer Questions)

1	Define instruction cycle.	Remember	CO3	ACSB07.09
2	Define data representation.	Understand	CO3	ACSB07.09
3	List memory reference instructions.	Understand	CO3	ACSB07.09
4	Explain number Systems in computer organization.	Remember	CO3	ACSB07.10
5	Define addressing Modes.	Understand	CO3	ACSB07.10
6	List the steps involved in an instruction cycle.	Understand	CO3	ACSB07.10
7	Explain Index Register Addressing Mode.	Remember	CO3	ACSB07.11
8	Differentiate Memory Reference and Register Reference Instructions.	Understand	CO3	ACSB07.11
9	Explain Register Reference and Input / Output Instructions.	Remember	CO3	ACSB07.09
10	Define data transfer and manipulation.	Understand	CO3	ACSB07.09
11	List different addressing modes.	Remember	CO3	ACSB07.11
12	Explain types of Interrupts	Understand	CO3	ACSB07.12
13	List floating point arithmetic operations.	Remember	CO3	ACSB07.10
14	Explain decimal arithmetic unit.	Understand	CO3	ACSB07.11

15	Differentiate addition and subtraction algorithms.	Remember	CO3	ACSB07.11
16	Define addressing Modes.	Understand	CO3	ACSB07.12
18	Explain program control.	Remember	CO3	ACSB07.11

<div align="center">

Part - B (Long Answer Questions)

</div>

1	Describe Memory Reference instructions.	Understand	CO3	ACSB07.09
2	Evaluate Program interrupt and design flow chart for interrupt cycle.	Remember	CO3	ACSB07.09
3	Illustrate Interrupt cycle and demonstration of the interrupt cycle.	Understand	CO3	ACSB07.09
4	Demonstrate $(52.75)10$ to binary and Demonstrate $(378.93)_{10 \, to}$ octal number system.	Remember	CO3	ACSB07.11
5	Demonstrate $(2598.675)_{10}$ to hexa decimal and Demonstrate $(10111101.01101001)_2$ to octal number system.	Understand	CO3	ACSB07.10
6	Demonstrate $(465.0647)_8$ to binary and Demonstrate $(764.235)_8$ to hexa decimal number system.	Understand	CO3	ACSB07.10
7	Evaluate r's complement and r-1's complement with examples.	Remember	CO3	ACSB07.11
8	Describe the below addressing modes with examples a. Implied Mode b. Immediate Mode c. Auto increment and Auto decrement Mode d. Direct and Indirect Address Modes.	Understand	CO3	ACSB07.09
9	Illustrate data transfer instructions and data manipulation instructions with examples.	Remember	CO3	ACSB07.09
10	Illustrate Program control instructions with examples.			
11	Explain the memory reference instructions with examples.	Understand	CO3	ACSB07.09
12	Describe input-output and interrupt along with neat diagram.	Remember	CO3	ACSB07.09
13	Explain Floating Point Arithmetic with an example.	Understand	CO3	ACSB07.09
14	Describe data Manipulation Instructions with example.	Remember	CO3	ACSB07.09
15	Explain decimal arithmetic unit in detail.	Understand	CO3	ACSB07.09
16	Define Addition and subtraction arithmetic operations with examples.	Remember	CO3	ACSB07.10
17	Describe the multiplication procedure of floating point numbers with block diagram	Understand	CO3	ACSB07.10
18	Discuss the derivation procedure of BCD Adder by an example with the help of Block diagram	Remember	CO3	ACSB07.10
19	Explain the three ways of adding decimal numbers with neat diagrams	Understand	CO3	ACSB07.10
20	Explain the three ways of adding decimal numbers with neat diagrams	Understand	CO3	ACSB07.11

<div align="center">

Part - C (Problem Solving and Critical Thinking Questions)

</div>

1	Demonstrate $(4057.06)_8$ to Binary and Demonstrate $(10111101.01101001)_2$ To octal Number system.	Understand	CO3	ACSB07.09
2	Demonstrate $(A03.56B)_{16}$ to decimal and $(101011101.10111)_2$ to Hexa decimal number system.	Remember	CO3	ACSB07.09
3	Demonstrate $(A64.BCCA)_{16}$ to Binary and Demonstrate $(764.325)_8$ to Hexa decimal number system.	Understand	CO3	ACSB07.12
4	Illustrate different algorithms of basic arithmetic operations using binary and decimal representation	Understand	CO3	ACSB07.09
5	Explain the data transfer manipulation.	Remember	CO3	ACSB07.09
6	Illustrate different algorithms of basic arithmetic operations using binary and decimal representation	Understand	CO3	ACSB07.09
7	Discuss the possible modes of handling data transfer to and from peripherals.	Remember	CO3	ACSB07.10
8	Write a program to evaluate the arithmetic statement: X=(A+B)*(C+D) Using a general register computer with three address instruction. Using a general register computer with two address instruction Using an accumulator type computer with Zero address instruction.	Understand	CO3	ACSB07.10
9	Draw a composite arithmetic circuit that implements all arithmetic micro operations. Explain the same clearly.	Remember	CO3	ACSB07.09
10	Write a c program to add two double-precision numbers. Provide necessary explanation for all the steps.	Understand	CO3	ACSB07.10

11	Explain interrupts handled by a basic computer and interrupt cycle with a flowchart.	Remember	CO3	ACSB07.09
12	Explain the differences between direct and indirect addressing instructions with example for each with the required memory reference.	Understand	CO3	ACSB07.09
13	Explain the differences between direct and indirect addressing instructions with example for each with the required memory reference.	Remember	CO3	ACSB07.11

MODULE– IV

INPUT-OUTPUT ORGANIZATION AND MEMORY ORGANIZATION

Part - A (Short Answer Questions)

1	List the factors that determine the storage device performance?	Understand	CO4	ACSB07.13
2	Define locality of reference? What are its types of locality of reference?	Remember	CO4	ACSB07.13
3	Explain basic concept of virtual memory technique?	Remember	CO4	ACSB07.13
4	Define Memory Access Time? Define instruction Cycle.	Understand	CO4	ACSB07.14
5	Describe the virtual memory organization and explain briefly?	Remember	CO4	ACSB07.14
6	Distinguish between the write-through and write-back policies pointing out their merits and demerits?	Remember	CO4	ACSB07.14
7	Explain cache memory to reduce the execution time?	Understand	CO4	ACSB07.15
8	Define CPU registers, Main memory, Secondary memory and cache memory?	Understand	CO4	ACSB07.16
8	List the various types of semiconductor RAMs?	Remember	CO4	ACSB07.16
9	Define Random Access Memory and types of RAMs present?	Remember	CO4	ACSB07.14
10	Explain the necessary for memory hierarchy?	Remember	CO4	ACSB07.14
11	Define HIT and MISS ratio in memory with an example?	Understand	CO4	ACSB07.13
12	Differentiate SRAM and DRAM?	Remember	CO4	ACSB07.14
13	List out two kinds of address locality of reference in cache memory?	Understand	CO4	ACSB07.14
14	List out the two parameters for performance of a computer system?	Remember	CO4	ACSB07.16
15	Define cache memory? Explain how it is used to reduce the execution time?	Understand	CO4	ACSB07.16
16	State the differences between static and dynamic memories?	Remember	CO4	ACSB07.15
17	Discuss the multilevel hierarchy of storage devices?	Understand	CO4	ACSB07.15
18	Define virtual or logical address?	Understand	CO4	ACSB07.13
19	Explain the mapping procedures adopted in the organization of a Cache Memory?	Remember	CO4	ACSB07.16
20	Discuss the function of a TLB? (Translation Look-aside Buffer)	Understand	CO4	ACSB07.16
21	Differentiate volatile and non volatile memory organization?	Remember	CO4	ACSB07.16
22	Explain memory management unit (MMU)?	Understand	CO4	ACSB07.13

Part - B (Long Answer Questions)

1	Describe input-output-processor (IOP) Organization in detail?	Understand	CO4	ACSB07.16
2	Explain DMA Controller with the block diagram?	Remember	CO4	ACSB07.16
3	Differentiate isolated I/O and memory mapped I/O?	Understand	CO4	ACSB07.15
4	Discuss Strobe Control method of Asynchronous data transfer technique?	Remember	CO4	ACSB07.16
5	Explain Asynchronous communication interface with diagram?	Understand	CO4	ACSB07.15
6	Explain 8089 Input-Output processor?	Remember	CO4	ACSB07.14
7	Discuss various techniques used for Modes of Transfer?	Understand	CO4	ACSB07.16
8	Discuss various techniques used for Modes of Transfer?	Remember	CO4	ACSB07.15
9	Define synchronous bus with read and write cycles?	Understand	CO4	ACSB07.16
10	List the different methods used for handling the situation when multiple Interrupts occur?	Remember	CO4	ACSB07.15
11	Define different factors considered while designing an I/O subsystem?	Understand	CO4	ACSB07.16
12	Explain DMA operation? State its advantages?	Remember	CO4	ACSB07.16
13	Differentiate synchronous and asynchronous communication?	Understand	CO4	ACSB07.15
14	Discuss interrupt masks provided in any processor?	Understand	CO4	ACSB07.17
15	List out the major functions of I/O system?	Understand	CO4	ACSB07.16

Part - C (Problem Solving and Critical Thinking Questions)

1	Explain system bus structure for multiprocessors.	Understand	CO4	ACSB07.15
2	What is cache coherence and why is it important in shared memory Multiprocessor systems? How can the problem be solved with a snoopy cache controller?	Remember	CO4	ACSB07.15
3	Describe asynchronous serial transfer?	Understand	CO4	ACSB07.16
4	Distinguish between a synchronous and an asynchronous data transfer	Remember	CO4	ACSB07.15
5	Explain strobe control in asynchronous data transfer along with hand shaking problem?	Understand	CO4	ACSB07.15
6	Discuss the usage of an I/O controller. In memory organization?	Remember	CO4	ACSB07.15
7	Explain a privileged instruction set in memory?	Understand	CO4	ACSB07.16
8	Define asynchronous bus with read and write cycles?	Remember	CO4	ACSB07.16
9	Define modes of data transfer in memory organization?	Understand	CO4	ACSB07.13
10	Discuss the necessity of an interface in memory organization?	Remember	CO4	ACSB07.13
11	Define the necessity and advantage of multiplexing the address and data bus?	Understand	CO4	ACSB07.13
12	Explain the program-controlled I/O with an example?	Remember	CO4	ACSB07.14
13	Define intra segment and inter segment program control transfer in computer organization? (near and far pointer concept)	Understand	CO4	ACSB07.16
14	Discuss memory mapped I/O in computer organization?	Remember	CO4	ACSB07.16
15	Explain the performance consideration in pipeline format?	Understand	CO4	ACSB07.16

MODULE– V

MULTIPROCESSORS

Part - A (Short Answer Questions)

1	Define arithmetic pipelining	Understand	CO5	ACSB07.17
2	Discuss the Pipeline conflicts	Remember	CO5	ACSB07.17
3	Define the RISC pipeline	Understand	CO5	ACSB07.17
4	Explain the four segments of pipelining.	Remember	CO5	ACSB07.17
5	Explain Vector processing?	Understand	CO5	ACSB07.17
6	Describe the memory interleaving	Understand	CO5	ACSB07.18
7	Define the cache coherence?	Understand	CO5	ACSB07.18
8	Explain the functioning of cross bar switch network?	Remember	CO5	ACSB07.18
9	Describe the different kinds of Multi stage switching networks?	Understand	CO5	ACSB07.19
10	Define multi-port memory.	Remember	CO5	ACSB07.19
12	Describe parallel processing	Remember	CO5	ACSB07.17
13	List the steps for importance for inter processor communication	Understand	CO5	ACSB07.20
14	Define pipeline control.	Remember	CO5	ACSB07.17
15	List the steps for instruction pipe lining	Understand	CO5	ACSB07.17

Part - B (Long Answer Questions)

1	Explain pipeline for floating point addition and subtraction.	Remember	CO5	ACSB07.18
2	Describe four segment pipelining.	Understand	CO5	ACSB07.17
3	Explain three segment instruction pipelines. Show the timing diagram and show the Timing diagram with data conflict.	Remember	CO5	ACSB07.17
4	Summarize the pipelining concept? Explain space-time diagram for Pipeline.	Understand	CO5	ACSB07.17
5	Write about the following concepts : RISCpipeline Vectorprocessing Arrayprocessors	Remember	CO5	ACSB07.17
6	Explain the following in related with Vector Processing SuperComputers Vectoroperations	Understand	CO5	ACSB07.17
7	Summarize are the different physical forms available to establish an inter-connection network? Give the summary of those.	Remember	CO5	ACSB07.17

8	Explain about the following concepts Delayedload Pre-fetch targetinstruction	Understand	CO5	ACSB07.19
9	Describe about pipeline? Explain arithmetic pipeline.	Remember	CO5	ACSB07.18
11	Explain hazards to the instruction pipeline with their solution	Remember	CO5	ACSB07.18
12	Explain interprocessor communication and synchronization.	Understand	CO5	ACSB07.19
13	Determine the number of clock cycles that it takes to process 200 task in a six segment pipeline	Remember	CO5	ACSB07.18
14	Explain popular Flynn Categories	Understand	CO5	ACSB07.18
15	Explain conventional pipelined execution representation	Remember	CO5	ACSB07.18
<td colspan="5" align="center">**Part - C (Problem Solving and Critical Thinking Questions)**</td>				
1	Describe system bus structure for multiprocessors.	Understand	CO5	ACSB07.18
2	Describe cache coherence and why is it important in shared memory Multiprocessorsystems? How can the problem be solved with a snoopy cache controller?	Understand	CO5	ACSB07.19
3	Explain the following concepts Working of 8 x 8 Omega Switchingnetwork. Functioning of Binary Tree network ith 2 x 2 Switches. Show a neat sketch.	Understand	CO5	ACSB07.19
4	Define the functioning of cross bar switch network? Explain. With a neat sketch.	Understand	CO5	ACSB07.20
5	Indicate how many switch points are there in a cross bar switch network that connect 'p' Processors to 'm' Memory modules.	Remember	CO5	ACSB07.20
6	List the different kinds of Multi stage switching networks? Explain with neat sketch. Compare their functioning.	Remember	CO5	ACSB07.20
7	Define the Multiprocessor? Explain its characteristics.	Understand	CO5	ACSB07.20
8	Write about the multi-port memory.	Remember	CO5	ACSB07.20

HOD , CSE