INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

COMPUTER SCIENCE AND ENGINEERING

TUTORIAL QUESTION BANK

Course Name	:	**COMPUTER ORGANIZATION AND ARCHITECTURE**
Course Code	:	ACS004
Class	:	B.Tech III Semester
Branch	:	Information Technology
Academic Year	:	2018 – 2019
Course Faculty	:	Dr. Y Mohana Roopa, Professor Dr. P.L.Srinivasa Murthy, Professor Mr. N.V.Krishna Rao, Assistant Professor Mr.A Praveen, Assistant Professor Ms.A Swapna, Assistant Professor

COURSE OVERVIEW:

This course introduces the principles of basic computer organization, CPU organization, and the basic architecture concepts. The course emphasizes performance and cost analysis, instruction set design, register transfer languages, arithmetic, logic and shift micro operations, pipelining, memory technology, memory hierarchy, virtual memory management, and I/O organization of computer, parallel processing and inter process communication and synchronization. This course in reached to student by power point presentations, lecture notes, and assignment questions ,previous model question papers, multiple choice questions and question bank of long and short answers.

COURSE OBJECTIVES:

The course should enable the students to:

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 LEARNING OUTCOMES:

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

CACS004.01	Describe the various components like input/output units, memory unit, control unit, arithmetic logic unit connected in the basic organization of a computer.
CACS004.02	Understand the interfacing concept with memory subsystem organization and input/output subsystem organization.
CACS004.03	Understand instruction types, addressing modes and their formats in the assembly language programs.
CACS004.04	Describe the instruction set architecture design for relatively simple microprocessor or Central Processing Unit.
CACS004.05	Classify the functionalities of various micro operations such as arithmetic, logic and shift micro operations.
CACS004.06	Understand the register transfer languages and micro operations involved in bus and memory transfers.

CACS004.07	Describe the design of control unit with address sequencing and microprogramming Concepts.
CACS004.08	Understand the connections among the circuits and the functionalities in the hardwired control unit.
CACS004.09	Describe the various phases involved in the instruction cycle viz. fetching, decoding, reading effective address and execution of instruction.
CACS004.10	Describe various data representations and explain how arithmetic and logical operations are performed by computers.
CACS004.11	Classify the various instructions formats to solve the arithmetic expressions in different addressing modes.
CACS004.12	Understand the functionality of various instruction formats for writing assembly language programs.
CACS004.13	Describe the implementation of fixed point and floating point addition, subtraction operations.
CACS004.14	Understand the concept of memory hierarchy and different typed of memory chips.
CACS004.15	Describe various modes of data transfer between CPU and I/O devices
CACS004.16	Understand the virtual memory concept with page replacement concept in memory organization
CACS004.17	Describe the hardware organization of associate memory and understand the read and write operations
CACS004.18	Describe the parallel processing concept with multiple functional units.
CACS004.19	Understand the multiprocessor concept with system bus structure and the concept of inter processor communication and synchronization
CACS004.20	Understand the different priority interrupts in the input-output organization in the computer architecture
CACS004.21	Possess the knowledge and skills for employability and to succeed in national and international level competitive examinations.
CACS004.22	Possess the knowledge and skills to design advanced computer architecture for current industry requirements.

TUTORIAL QUESTION BANK

UNIT – I

INTRODUCTION TO COMPUTER ORGANIZATION

Part - A (Short Answer Questions)

S. No	QUESTIONS	Bloom's Taxonomy Level	Course Learning Outcomes
1	Define Computer Architecture.	Remember	CACS004.04
2	Define Computer organization.	Remember	CACS004.01
3	List the types of computers	Remember	CACS004.01
4	Explain the functional units of a computer	Understand	CACS004.01
5	Explain the types of memory.	Understand	CACS004.02
6	Explain about Arithmetic And Logic Unit.	Remember	CACS004.02
7	Define instruction cycle.	Remember	CACS004.03
8	Explain about central processing unit	Understand	CACS004.04
9	Define different memory chips.	Understand	CACS004.02
10	Differentiate between the static and dynamic RAMs.	Understand	CACS004.02
11	List out the Levels of programming languages.	Remember	CACS004.03
12	Explain Instruction formats	Understand	CACS004.03
13	Explain about Instruction set architecture (ISA) design	Remember	CACS004.04
14	Explain about the data transfer instructions	Understand	CACS004.03
15	Explain number Systems in computer organization.	Remember	CACS004.01

Part - B (Long Answer Questions)			
1	Describe the basic instruction types in assembly language programming?	Understand	CACS004.03
2	Give the control sequence for execution of instruction	Remember	CACS004.03
3	With a general block diagram, explain the functions of the processor registers.	Understand	CACS004.01
4	Describe the connection between inside the processor; explain the functions of Each component?	Remember	CACS004.02
5	Describe the Basic Computer Organization	Understand	CACS004.01
6	Explain in detail about the instruction cycle	Remember	CACS004.03
7	Describe the Input-output subsystem organization and interfacing	Understand	CACS004.02
8	Explain important steps for computer design	Remember	CACS004.02
9	Describe the different types of fields that are part of an instruction	Understand	CACS004.02
10	Describe the basic components of a Microprocessor	Remember	CACS004.02
11	Describe different types of interrupts in a microprocessor system	Understand	CACS004.03
12	Differentiate between the different kinds of ROMs	Remember	CACS004.04
13	Define the terms ‘stack' and 'subroutine'. How are they useful in implementation of an architecture of a processor	Understand	CACS004.03
14	Explain Computer Architecture with diagram	Remember	CACS004.03
15	Describe the difference between computer architecture and computer organization	Remember	
Part - C (Problem Solving and Critical Thinking Questions)			
1	Consider a processor with 64 registers and an instruction set of size twelve. Each instruction has five distinct fields, namely, opcode, two source register identifiers, one destination register identifier, and a twelve-bit immediate value. Each instruction must be stored in memory in a byte-aligned fashion. If a program has 100 instructions, Find the amount of memory (in bytes) consumed by the program text	Understand	CACS004.02
2	A processor has 40 distinct instructions and 24 general purpose registers. A 32-bit instruction word has an opcode, two registers operands and an immediate operand. Find the number of bits available for the immediate operand field_____	Remember	CACS004.03
3	Match each of the high level language statements given on the left hand side with the most natural addressing mode from those listed on the right hand side. 1. A[1] = B[J]; a. Indirect addressing 2. while [*A++]; b. Indexed addressing 3. int temp = *x; c. Autoincrement	Understand	CACS004.03
4	Explain briefly memories organized in hierarchy .Describe the factors to be considered while selecting a particular memory type and draw a suitable diagram.	Remember	CACS004.03
5	Describe the difference between the general purpose register and accumulator and stack processor architecture	Understand	CACS004.04
UNIT – II			
ORGANIZATION OF A COMPUTER			
Part - A (Short Answer Questions)			
1	Define the register transfer language?	Remember	CACS004.05
2	Define bus and memory transfer?	Understand	CACS004.05
3	Describe the different arithmetic micro operations.	Remember	CACS004.06
4	Explain the different logical micro operations.	Understand	CACS004.06
5	State the different shift micro operations	Remember	CACS004.06
6	Explain about the control circuitry?	Understand	CACS004.08
7	Define the effective addressing?	Remember	CACS004.08
8	Differentiate Memory Reference and Register Reference Instructions.	Understand	CACS004.06
9	Differentiate Register Reference and Input/output Instructions.	Remember	CACS004.06
10	Define Interrupt and classify types of Interrupts.	Understand	CACS004.07
11	Describe addressing Modes.	Remember	CACS004.07
12	Explain Index Register Addressing Mode.	Understand	CACS004.07
13	Explain the importance of different addressing modes in computer architecture	Remember	CACS004.07

14	Explain a memory operation in each case: (i)M[AR] ← R3 (ii) R2 ← M[AR]	Understand	CACS004.06
15	Describe tri state buffer with their application	Remember	CACS004.05
	Part - B (Long Answer Questions)		
1	State the use of buffers? Explain about tri-state buffers. Explain about high impedance state.	Remember	CACS004.05
2	Explain commonly employed bit shift operators such as shift left, right, circular shift left/right and Arithmetic shift left/right.	Understand	CACS004.06
3	Explain about Arithmetic logic shift unit with neat diagram.	Remember	CACS004.06
4	Demonstrate increment, decrement, complement and clear 4 bit registers using register transfer language.	Understand	CACS004.06
5	Describe registers selection circuit to select one of the four 4-bit registers content on to bus. Give fuller explanation.	Remember	CACS004.06
6	Define the register transfer languages? Explain few RTL statements for branching with their actual Functioning.	Remember	CACS004.06
7	Explain about stack organization used in processors. What do you understand by register stack and Memory stack?	Understand	CACS004.08
8	Explain any eight addressing modes in detail	Remember	CACS004.07
9	Write a program to evaluate the arithmetic statement.	Understand	CACS004.08
10	Write a brief note on sub routine call and return.	Remember	CACS004.07
11	Explain the micro programmed control organization.	Understand	CACS004.08
12	Define an instruction format. Explain different types of instruction formats in detail	Understand	CACS004.08
13	Explain shift micro operation in detail. Also draw and explain 4-bit combinational circuit	Remember	CACS004.07
14	Explain the importance of different addressing modes in computer architecture with suitable example.	Understand	CACS004.08
15	Define the following: (i) Microcode (ii) Microinstruction	Remember	CACS004.07
	Part - C (Problem Solving and Critical Thinking Questions)		
1	Explain the selection of address for control memory in microprogrammed control unit	Understand	CACS004.08
2	Design the 4-bit arithmetic circuit for arithmetic micro operations.	Remember	CACS004.07
3	Describe the micro instruction format in detail.	Understand	CACS004.08
4	Explain the need of subroutine register in a control unit? Explain.	Remember	CACS004.07
5	Discuss the need of some bits of current microinstruction to generate address of the next microinstruction? Support with a live example.	Understand	CACS004.06
6	Explain the mapping from micro-operation to a micro instruction address?	Remember	CACS004.07
7	Describe how microinstructions are arranged in control memory and how they are interpreted.	Understand	CACS004.08
8	Write a program to evaluate the arithmetic statement X = (A + B) *(C + D). ii. Using a general register computer with two address instructions. iii. Using stack organized computer with zero address operation instruction.	Remember	CACS004.07
	CPU AND COMPUTER ARITHMETIC **Part - A (Short Answer Questions)**		
1	Define instruction cycle.	Remember	CACS004.09
2	Define data representation.	Understand	CACS004.09
3	List memory reference instructions.	Understand	CACS004.09
4	Explain number Systems in computer organization.	Remember	CACS004.10
5	Explain interrupt addressing modes.	Understand	CACS004.10
6	List the steps involved in an instruction cycle.	Understand	CACS004.10
7	Explain Index Register Addressing Mode.	Remember	CACS004.11
8	Explain Computer arithmetic.	Understand	CACS004.11

9	List different addressing modes.	Remember	CACS004.11
10	Explain types of Interrupts	Understand	CACS004.12
11	List floating point arithmetic operations.	Remember	CACS004.10
12	Explain decimal arithmetic unit.	Understand	CACS004.11
13	Define data transfer and manipulation.	Remember	CACS004.09
14	Define input-output processor.	Understand	CACS004.09
15	Differentiate Memory Reference and Register Reference Instructions.	Remember	CACS004.09
16	Explain Register Reference and Input / Output Instructions.	Understand	CACS004.11
17	Differentiate addition and subtraction algorithms.	Remember	CACS004.11
18	Define addressing Modes.	Understand	CACS004.12
19	Explain program control.	Remember	CACS004.11
20	Define program control.	Understand	CACS004.11
Part - B (Long Answer Questions)			
1	Differentiate Execute and Fetch phases.	Understand	CACS004.09
2	Explain instruction cycle with example.	Remember	CACS004.09
3	List different addressing modes.	Understand	CACS004.09
4	Explain Fetch-Execute cycle with diagram.	Remember	CACS004.11
5	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	CACS004.09
6	Explain the three categories of computer instructions such as data transfer instructions , data manipulation instructions and program control instructions.	Remember	CACS004.09
7	Explain the memory reference instructions with examples.	Understand	CACS004.09
8	Define input-output and interrupt.	Remember	CACS004.09
9	Explain Floating Point Arithmetic with an example.	Understand	CACS004.09
10	Describe data Manipulation Instructions with example.	Remember	CACS004.09
11	Explain decimal arithmetic unit in detail.	Understand	CACS004.09
12	Define Addition and subtraction arithmetic operations with examples.	Remember	CACS004.10
13	Describe the multiplication procedure of floating point numbers with block diagram	Understand	CACS004.10
14	Discuss the derivation procedure of BCD Adder by an example with the help of Block diagram	Remember	CACS004.10
15	Explain the three ways of adding decimal numbers with neat diagrams	Understand	CACS004.10
16	Explain the three ways of adding decimal numbers with neat diagrams	Understand	CACS004.11
Part - C (Problem Solving and Critical Thinking Questions)			
1	Discuss in detail about data transfer and data manipulation instructions.	Understand	CACS004.09
2	Write a note on program control instructions.	Remember	CACS004.09
3	Explain about following floating point representations. a)single-precision format b)double-precision format	Understand	CACS004.12
4	Explain the setup involved in instruction execution using state diagram.	Understand	CACS004.09
5	Describe briefly about fetch routine in instruction formats.	Remember	CACS004.10
6	Explain the processor with multiple functional units with the help of flowchart.	Understand	CACS004.10
7	Illustrate data paths and control flow for sequencing in CPUs with diagrams.	Remember	CACS004.11
8	Explain Microprogramming of control unit of CPU with example.	Understand	CACS004.12
9	Explain the sequence of micro operations needed to execute the following instructions a.STA b. BSA c. ISZ d. BUN	Remember	CACS004.12
10	Convert decimal number 8620 into a.BCD b. Octal c .Binary d. hexadecimal	Understand	CACS004.09
11	Illustrate different algorithms of basic arithmetic operations using binary and decimal representation	Understand	CACS004.09

12	Explain the data transfer manipulation.	Remember	CACS004.09
13	Illustrate different algorithms of basic arithmetic operations using binary and decimal representation	Understand	CACS004.09
14	Discuss the possible modes of handling data transfer to and from peripherals.	Remember	CACS004.10
15	Write a program to evaluate the arithmetic statement: X=(A+B)*(C+D) i. Using a general register computer with three address instruction. ii. Using a general register computer with two address instruction iii. Using an accumulator type computer with Zero address instruction.	Understand	CACS004.10
16	Draw a composite arithmetic circuit that implements all arithmetic micro operations. Explain the same clearly.	Remember	CACS004.09
17	Write a c program to add two double-precision numbers. Provide necessary explanation for all the steps.	Understand	CACS004.10
18	Explain interrupts handled by a basic computer and interrupt cycle with a flowchart.	Remember	CACS004.09
19	Explain the differences between direct and indirect addressing instructions with example for each with the required memory reference.	Understand	CACS004.09
20	Explain the differences between direct and indirect addressing instructions with example for each with the required memory reference.	Remember	CACS004.11

UNIT – IV

INPUT-OUTPUT ORGANIZATION AND MEMORY ORGANIZATION

Part - A (Short Answer Questions)

1	List the factors that determine the storage device performance?	Understand	CACS004.13
2	Define locality of reference? What are its types of locality of reference?	Remember	CACS004.13
3	Explain basic concept of virtual memory technique?	Remember	CACS004.13
4	Define Memory Access Time? Define instruction Cycle.	Understand	CACS004.14
5	Describe the virtual memory organization and explain briefly?	Remember	CACS004.14
6	Distinguish between the write-through and write-back policies pointing out their merits and demerits?	Remember	CACS004.14
7	Explain cache memory to reduce the execution time?	Understand	CACS004.15
8	Define CPU registers, Main memory, Secondary memory and cache memory?	Understand	CACS004.16
8	List the various types of semiconductor RAMs?	Remember	CACS004.16
9	Define Random Access Memory and types of RAMs present?	Remember	CACS004.14
10	Explain the necessary for memory hierarchy?	Remember	CACS004.14
11	Define HIT and MISS ratio in memory with an example?	Understand	CACS004.13
12	Differentiate SRAM and DRAM?	Remember	CACS004.14
13	List out two kinds of address locality of reference in cache memory?	Understand	CACS004.14
14	List out the two parameters for performance of a computer system?	Remember	CACS004.16
15	Define cache memory? Explain how it is used to reduce the execution time?	Understand	CACS004.16
16	State the differences between static and dynamic memories?	Remember	CACS004.15
17	Discuss the multilevel hierarchy of storage devices?	Understand	CACS004.15
18	Define virtual or logical address?	Understand	CACS004.13
19	Explain the mapping procedures adopted in the organization of a Cache Memory?	Remember	CACS004.16
20	Discuss the function of a TLB? (Translation Look-aside Buffer)	Understand	CACS004.16
21	Differentiate volatile and non volatile memory organization?	Remember	CACS004.16
22	Explain memory management unit (MMU)?	Understand	CACS004.13

Part - B (Long Answer Questions)

1	Describe input-output-processor (IOP) Organization in detail?	Understand	CACS004.16
2	Explain DMA Controller with the block diagram?	Remember	CACS004.16
3	Differentiate isolated I/O and memory mapped I/O?	Understand	CACS004.15
4	Discuss Strobe Control method of Asynchronous data transfer technique?	Remember	CACS004.16
5	Explain Asynchronous communication interface with diagram?	Understand	CACS004.15

6	Explain 8089 Input-Output processor?	Remember	CACS004.14
7	Discuss various techniques used for Modes of Transfer?	Understand	CACS004.16
8	Discuss various techniques used for Modes of Transfer?	Remember	CACS004.15
9	Define synchronous bus with read and write cycles?	Understand	CACS004.16
10	List the different methods used for handling the situation when multiple Interrupts occur?	Remember	CACS004.15
11	Define different factors considered while designing an I/O subsystem?	Understand	CACS004.16
12	Explain DMA operation? State its advantages?	Remember	CACS004.16
13	Differentiate synchronous and asynchronous communication?	Understand	CACS004.15
14	Discuss interrupt masks provided in any processor?	Understand	CACS004.17
15	List out the major functions of I/O system?	Understand	CACS004.16
	Part - C (Problem Solving and Critical Thinking Questions)		
1	Explain system bus structure for multiprocessors.	Understand	CACS004.15
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	CACS004.15
3	Describe asynchronous serial transfer?	Understand	CACS004.16
4	Distinguish between a synchronous and an asynchronous data transfer	Remember	CACS004.15
5	Explain strobe control in asynchronous data transfer along with hand shaking problem?	Understand	CACS004.15
6	Discuss the usage of an I/O controller. In memory organization?	Remember	CACS004.15
7	Explain a privileged instruction set in memory?	Understand	CACS004.16
8	Define asynchronous bus with read and write cycles?	Remember	CACS004.16
9	Define modes of data transfer in memory organization?	Understand	CACS004.13
10	Discuss the necessity of an interface in memory organization?	Remember	CACS004.13
11	Define the necessity and advantage of multiplexing the address and data bus?	Understand	CACS004.13
12	Explain the program-controlled I/O with an example?	Remember	CACS004.14
13	Define intra segment and inter segment program control transfer in computer organization? (near and far pointer concept)	Understand	CACS004.16
14	Discuss memory mapped I/O in computer organization?	Remember	CACS004.16
15	Explain the performance consideration in pipeline format?	Understand	CACS004.16
	UNIT – V		
	MULTIPROCESSORS		
	Part - A (Short Answer Questions)		
1	Define arithmetic pipelining	Understand	CACS004.17
2	Discuss the Pipeline conflicts	Remember	CACS004.17
3	Define the RISC pipeline	Understand	CACS004.17
4	Explain the four segments of pipelining.	Remember	CACS004.17
5	Explain Vector processing?	Understand	CACS004.17
6	Describe the memory interleaving	Understand	CACS004.18
7	Define the cache coherence?	Understand	CACS004.18
8	Explain the functioning of cross bar switch network?	Remember	CACS004.18
9	Describe the different kinds of Multi stage switching networks?	Understand	CACS004.19
10	Define multi-port memory.	Remember	CACS004.19
12	Describe parallel processing	Remember	CACS004.17
13	List the steps for importance for inter processor communication	Understand	CACS004.20
14	Define pipeline control.	Remember	CACS004.17

15	List the steps for instruction pipe lining	Understand	CACS004.17
	Part - B (Long Answer Questions)		
1	Explain pipeline for floating point addition and subtraction.	Remember	CACS004.18
2	Describe four segment pipelining.	Understand	CACS004.17
3	Explain three segment instruction pipelines. Show the timing diagram and show the Timing diagram with data conflict.	Remember	CACS004.17
4	Summarize the pipelining concept? Explain space-time diagram for Pipeline.	Understand	CACS004.17
5	Write about the following concepts : a. RISC pipeline b. Vector processing c. Array processors	Remember	CACS004.17
6	Explain the following in related with Vector Processing a. Super Computers b. Vector operations	Understand	CACS004.17
7	Summarize are the different physical forms available to establish an inter-connection network? Give the summary of those.	Remember	CACS004.17
8	Explain about the following concepts a. Delayed load b. Pre-fetch target instruction	Understand	CACS004.19
9	Describe about pipeline? Explain arithmetic pipeline.	Remember	CACS004.18
11	Explain hazards to the instruction pipeline with their solution	Remember	CACS004.18
12	Explain interprocessor communication and synchronization.	Understand	CACS004.19
13	Determine the number of clock cycles that it takes to process 200 task in a six segment pipeline	Remember	CACS004.18
14	Explain popular Flynn Categories	Understand	CACS004.18
15	Explain conventional pipelined execution representation	Remember	CACS004.18
	Part - C (Problem Solving and Critical Thinking Questions)		
1	Describe system bus structure for multiprocessors.	Understand	CACS004.18
2	Describe cache coherence and why is it important in shared memory multiprocessor systems? How can the problem be solved with a snoopy cache controller?	Understand	CACS004.19
3	Explain the following concepts a. Working of 8 x 8 Omega Switching network. b. Functioning of Binary Tree network i^{th} 2 x 2 Switches. Show a neat sketch.	Understand	CACS004.19
4	Define the functioning of cross bar switch network? Explain. With a neat sketch.	Understand	CACS004.20
5	Indicate how many switch points are there in a cross bar switch network that connect 'p' Processors to 'm' Memory modules.	Remember	CACS004.20
6	List the different kinds of Multi stage switching networks? Explain with neat sketch. Compare their functioning.	Remember	CACS004.20
7	Define the Multiprocessor? Explain its characteristics.	Understand	CACS004.20
8	Write about the multi-port memory.	Remember	CACS004.20

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