INSTITUTE OF AERONAUTICAL ENGINEERING

Dundigal, Hyderabad - 500 043

INFORMATION TECHNOLOGY

TUTORIAL QUESTION BANK

Course Name	: Digital Logic Design and Computer Organization
Course Code	: A30402
Class	: II B. Tech I Semester
Branch	: Information Technology
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Course Faculty	: Mr. E. Sunil Reddy, Assistant Professor, IT

OBJECTIVES

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner's learning process.

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	UNIT-1		
	Basic Structure of Computers and Data Representation		
	Part - A (Short Answer Questions)		
1	**Define** a Digital Computer?	Knowledge	1
2	**List** the Functional Units.	Knowledge	1
3	**Discuss** about Data Bus.	Understand	1
4	**Discuss** about Bus Arbitration.	Understand	1
5	**Discuss** about System software?	Understand	1
6	**Explain** the term Compiler.	Understand	1
7	**Distinguish** between high and low level languages.	Analyze	1
8	**Discuss** about Assembler.	Understand	1
9	**Discuss** about memory unit.	Understand	1
10	**Solve** the decimal number 1234.5678 into binary form.	Apply	1
11	**List** the steps involved in execution of a program?	Knowledge	1
12	**Solve** the Hexadecimal number 2456 into decimal number.	Apply	1

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
13	**Explain** the one's and two's complements representation of a binary number.	Understand	1
14	**Explain** the importance of gray code.	Understand	1
15	**Solve** the following binary numbers into equivalent decimal number (a) 0.1111 (b) 111.1011	Apply	1
16	**Solve** operation Subtract the following using 2's Complement method (a) $(101011)_2$ from $(111001)_2$ (b) $(111001)_2$ from $(101011)_2$	Apply	1

Part - B   (Long Answer Questions)

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
1	**Explain** the various types of computers and their applications.	Understand	1
2	**Explain** the basic functional units of a computer and explain each unit in detail.	Understand	1
3	**Discuss** the operational concepts of a digital computer.	Understand	1
4	(a)**Define** by system software? (b)**Explain** various functions of system software. (c) **Define** a text editor?	Understand	1
5	**Explain** Various types of Buses.	Understand	1
6	**Explain** various performance measures used to represent computer performance.	Understand	1
7	**Differentiate** between RISC and CISC	Analyze	1
8	**Describe** the introduction of each generation of computer system	Understand	2
9	**Solve** the number $(+465.5)_{10}$ as a floating point binary number with 24 bits the Normalized fraction mantissa has 16 bits and the exponent has 8 bits.	Apply	1
10	**Solve** the single precision representation for 42.75 and 16.125.	Apply	1
11	**Solve** 32.75 and 18.125 in single precision IEEE 754 representation.	Apply	1
12	**Solve** the 1's and 2's complement of the following binary numbers, 1010101,0111000,0000001,10000,00000 Also obtain 9's and 10's complement of the following decimal Numbers, 09900, 10000, 00000.	Apply	1
13	**Show** decimal number 8620 in (i) BCD (ii) Excess-3 code (iii) 2421 code (iv) As a binary number	Apply	1
14	**Explain** the classification of binary codes.	Understand	1
15	**Discuss** in detail about binary signed number.	Understand	1
16	**Calculate** the following to binary and then to gray code, (a) 1001_{16} (b) $ABEF_{16}$ (c) 7623_8 (d) 1234_8 (e) 1257_{10} (f) 2239_{10}	Apply	1

Part - C (Problem Solving and Critical Thinking Questions)

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
1	**Solve** the following binary numbers into equivalent decimal number (a)0.111 (b)111.1011	Apply	1

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
2	**Solve** operation Subtract the following using 2's Complement method (a)$(101011)_2$ from $(111001)_2$ (b)$(111001)_2$ from$(101011)_2$	Apply	1
3	**Solve** the following (a).Decimal number 1234.5678 into binary. (b). Hexa decimal number 2456 into binary.	Apply	1
4	**Solve** the following binary numbers into decimal, octal and hexa decimal numbers.		
5	**Solve** the following octal numbers into binary, decimal and hexadecimal number system. (a). 3711 (b). 4057.66	Apply	1
6	**Solve** the following hexadecimal numbers into binary, octal and decimal. (a). 4236 (b). AB6.13	Apply	1
7	**Solve** the following. (a). $(A6)_{16}$=( )$_{10}$ (b). $(1266)_8$=( )$_{10}$ (c).$(10100011)_2$=( )$_{10}$ (d). $(372)_{10}$= ( )$_{16}$	Apply	1
8	**Solve** the hexadecimal number F3A7C2 to binary and octal.	Apply	1

UNIT-II

Digital Logic Circuits-I and Digital Logic Circuits-II

Part - A   (Short Answer Questions)

1.	**Discuss** the symbols of AND ,OR and NOT gates	Understand	2
2.	**List** the Universal gates and draw their symbols.	Knowledge	2
3.	**Discuss** gate level minimization?	Understand	2
4.	**Define** K-map.	Knowledge	2
5.	**Solve** and Simplify the Boolean expression, $S(x, y, z)=\sum(1,2,4,7)$	Apply	4
6.	**Solve** and Simplify the following Boolean function using four-variable map $F(w, x, y, z)=\sum(1,3,7,11,15)+d(0,2,5)$.	Apply	4
7.	**Define** Latch.	Knowledge	6
8.	**Design** NAND and NOR latch.	Create	6
9.	**Define** a flip-flop.	Knowledge	6
10.	**Define** Synchronous and asynchronous inputs and their use.	Knowledge	7
11.	**List** the applications of shift registers.	Knowledge	7
12.	**Define** Counters and give its classifications.	Knowledge	7
13.	**Define** Combinational Circuit? Give Examples.	Knowledge	7
14.	**Define** half adder and full adder	Knowledge	7
15.	**Define** Decoder.	Knowledge	7
16.	**List** the applications of a Decoder.	Knowledge	7

Part - B   (Long Answer Questions)

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
1.	**Explain** the basic logic functions along with their truth tables.	Understand	3
2.	**Describe** the truth tables, Boolean equations and symbols of the basic logic gates.	Understand	2
3.	**Explain** A NOR gate is also referred to as negative AND gate.	Understand	2
4.	**Solve** the expression $Y=AB^1 + A^1B$ using only 2 input NAND gates.	Apply	2
5.	**Solve** and Simplify the Boolean equation $Y=AB^1C^1 +A^1BC^1 +AB^1C +ABC^1$ and realize the logic circuit.	Apply	5
6	**Solve** and Simplify the following Boolean functions, using three-variable maps, $F(x, y, z) =\sum (0, 2, 6, 7)$ $F (a, b, c) =\sum (0, 1, 2, 3, 7)$.	Apply	5
7.	**Solve** and Simplify the following Boolean function using K map, $F(A,B,C,D) = \sum(3,7,11,13,14,15)$.	Apply	5
8.	**Solve** the following operation Minimize $F (A,B,C,D)=\sum (3, 6, 8, 11, 13, 14)$ and don't cares $\sum (4,10,15)$.	Apply	5
9.	**Solve** and Simplify the following Boolean function $F(W,X,Y,Z) = \sum (1,3,7,11,15)$ and the don't care conditions $d(W,X,Y,Z) = \sum (0,2,5)$	Apply	5
10.	**Define** a latch and a flip-flop. Mention the similarities and differences between them.	Knowledge	5
11.	**Sketch** a neat circuit diagram of positive triggered D flip-flop and explain its operation.	Apply	6
12.	**Explain** the operation of a JK flip flop using its block diagram and truth table. What are its limitations?	Understand	6
13.	**Describe** the working of a shift right register.	Understand	12
14.	**Sketch and explain** a 4-bit synchronous binary counter based on JK flip flops.	Apply	6
15.	**Explain** the operation of 3-to-8 decoder with circuit diagram.	Understand	7
16.	**Sketch** the logic diagram of a 2-to-4 line decoder using NOR gates and explain its functioning.	Apply	2
17.	**Construct** a 5-to-32 line decoder with four 3-to-8 line decoders with enable and one 2-to-4 line decoder.	Apply	2
18.	**Describe** a combinational logic circuit is defined by the following Boolean functions. $F_1= \overline{A}\overline{B}\overline{C} + AC$ $F_2= A\overline{B}\overline{C} + \overline{A}B$ $F_3= A\overline{B}C + AB$ Construct a circuit with a decoder and external gates.	Understand	12
19.	**Explain** combinational PLD? List and describe the major types of combinational PLDs.	Knowledge	9
20	**Define** PAL? **Explain** the internal structure of PAL.	Understand	9
21	**Solve** and Simplify the following Boolean functions with a PAL. $F_1(A,B,C) = \sum (0,1,2,4)$ $F_2(A,B,C) = \sum (0,5,6,7)$	Apply	5
22	Design a PAL for the following equation, $F= a^1 b\ c + b^1 c + ab$	Create	6

Part - C (Problem Solving and Critical Thinking Questions)

1	**Describe** a NOR gate is also referred to as negative AND gate why?	Understand	2
2	**Solve** the multi-level NAND circuit for the following expression $(AB^1+CD^1)E+BC(A+B)$	Apply	5

UNIT-III

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	Computer Arithmetic and Instruction set & Addressing		
1	**List** the two reasons when the divide overflow occurs?	Knowledge	12
2	**Define** high performance arithmetic?	Knowledge	12
3	**Write** short notes on residue arithmetic.	Understand	12
4	**Describe** register transfer notation?	Knowledge	12
5	**Write** short notes on three address instructions.	Knowledge	12
6	**Describe** Conditional jump?	Understand	12
7	**Write** short notes on 1's complement addition.	Knowledge	12
8	**Describe** divide overflow?	Understand	12
9	**List** the steps for addition or subtraction of two floating point numbers?	Knowledge	12
10	**Write** short notes on big-endian.	Knowledge	12
11	**Write** short notes on little-endian.	Knowledge	12
Part - B (Long Answer Questions)			
1	**Explain** addition subtraction algorithm. With diagram.	Understand	8
2	**Explain** multiplication algorithm. With diagram.	Understand	8
3	**Sketch** and Explain booth multiplication algorithm. With numerical example.	Knowledge	8
4	**Sketch** and Explain division algorithm. With numerical example.	Knowledge	8
5	**Explain** floating point addition subtraction algorithm. With diagram.	Understand	8
6	**Explain** floating point multiplication algorithm. With diagram.	Understand	8
7	**Explain** floating-point division algorithm. With diagram.	Understand	8
8	**Explain** decimal division algorithm. With diagram.	Understand	8
9	**Explain** BCD-Adder with block diagram.	Understand	8
10	**Discuss** about the following. (i) Condition codes (ii) Straight line sequencing.	Understand	8
11	**Explain** various addressing modes of computer with examples.	Understand	11
12	**Explain** in detail the basic instruction types with examples.	Understand	11
13	**Explain** about the Addressing modes present in IA-32 Pentium processor.	Understand	11
14	**Explain** the format of an IA-32 instruction.	Understand	11
15	**Describe** the format of status register of IA-32 and explain each of the flag.	Understand	8
16	**Describe** how many address bits are needed to create an address space of 4G.	Understand	11
1	**Discuss** the program that uses indirect addressing to access successive numbers in the list.	Understand	11
2	**Explain how** the program for C+ [A] + [B] is executed.	Understand	11
	UNIT-IV **Processor Organization and Memory Organization**		
1	**Write** short notes on micro-program sequencing.	Knowledge	13
2	**List** the steps required for executing an instructions?	Knowledge	13
3	**Write** short notes on hardwired control unit.	Knowledge	13
4	**Write** short notes on micro-programmed control unit.	Knowledge	13

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
5	**Write** short notes on flash memory.	Knowledge	13
6	**Write** short notes on cache memory.	Knowledge	13
7	**Write** short notes on Read only memories.	Knowledge	13
8	**Describe** direct mapping technique?	Understand	13
9	**Write** about set associative mapping technique.	Knowledge	13
10	**Describe** paged segmentation?	Understand	13

Part - B (Long Answer Questions)

1	**Explain** single-bus organization of the data path inside a Processor.	Understand	16
2	**Explain** about multiple bus organization.	Understand	16
3	**Define** the following (i) Micro operation (ii) Micro program (iii) Micro instruction	Knowledge	16
4	**Define** memory? Briefly **explain** micro computer memories.	Understand	17
5	**Discuss** the purpose of main memory and secondary memory in a computer. What is a non-volatile memory? Give examples of volatile and non-volatile memory.	Understand	17
6	**Discuss** in detail memory interleaving.	Understand	17
7	**Explain** in detail various cache memory organizations.	Understand	18
8	**Define** cache memory? Why has it become an integrated part of modern CPUs? What is a hit and miss? What is meant by hit ratio?	Knowledge	18
9	**Describe** a brief note on page replacement algorithms.	Knowledge	18
10	**Explain** each of the following (i) Page fault (ii) Page table (iii) Page replacement (iv) Translation look-aside buffer.	Understand	18
11	**Compare** the characteristics of a floppy disk and a hard disk.	Understand	17
12	**Describe** the limitations of a semiconductor memory? Explain in detail various secondary storage devices.	Knowledge	18
13	**Explain** the memory management requirements.	Understand	18

Part - C (Problem Solving and Critical Thinking Questions)

1	**Draw** the timing diagram of a memory write operation and explain.	Understand	16
2	**Explain the** control sequence for execution of the instruction ADD(R2),R1 for the single bus architecture.	Understand	18
3	**Describe** the steps required to execute Move R2,(R1)	Knowledge	18
4	**Explain** the register transfer notation for the following (i).To transfers the contents of memory location LOC into processor register R1. (ii). Adds the contents of register R1 and R2 and place their sum into register R3	Understand	17
5	**Describe** a computer uses Ram chips of 1024 X 1 capacity. (i). How many chips are needed and how should their address lines be connected to provide a memory capacity of 1024 bytes. (ii).How many chips are needed to provide a memory capacity of 16 k bytes.	Understand	17
6	**Describe** an address space is specified by 24-bits and the corresponding memory space by 16-bits. (i). How many words are there in the address space (ii). How many words are there in the memory space.	Understand	17

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	UNIT-V **Input / Output Organization**		
Part - A (Short Answer Questions)			
1	**List** the advantages of interrupt driven I/O?	Knowledge	15
2	**Write** short notes on bus request.	Knowledge	17
3	**Write** short notes on control register.	Knowledge	17
4	**List** the advantages of DMA transfers?	Knowledge	17
5	**Define** a PCI bus.	Knowledge	14
6	**Define** USB.	Knowledge	14
7	**Write** short notes on bulk transfer.	Knowledge	14
8	**Write** short notes on interrupt transfer.	Knowledge	14
9	**List** the design issues of USB?	Knowledge	14
10	**Write** short notes on dual address cycle command.	Knowledge	14
Part - B (Long Answer Questions)			
1	**Explain** the different kinds of I/O communication techniques? What are the relative advantages and disadvantages? Compare and contrast all techniques	Knowledge	14
2	**Discuss** with suitable example the concept of programmed I/O.	Understand	14
3	**Differentiate** between a subroutine and an interrupt service routine?	Knowledge	14
4	**Sketch** block diagram of typical daisy-chain priority interrupt scheme and explain its operation.	Apply	14
5	**Write** short notes on DMA controller.	Knowledge	14
6	**Write** short notes on DMA Transfer.	Knowledge	14
7	**Explain** the need for bus arbitration? Explain the two approaches to bus arbitration.	Understand	15
8	**Explain** PCI with a neat sketch.	Understand	15
9	**Explain** Brief notes on the following standard I/O Interfaces. (a) SCSI (b) PCI	Understand	15
10	**Discuss** about USB Protocols.	Understand	14
11	**Explain** the disadvantage of the strobe method? Explain how handshake method solves the problem?	Understand	15

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