1. Answer the following Multiple Choice Questions:
   
   (1) The number 102 written in binary is
       (a) 0110011  (b) 110011  
       (c) 110110  (d) 1100110
   
   (2) In binary arithmetic, calculate 11010 – 1101
       (a) 101  (b) 1011  
       (c) 1101  (d) 10101
   
   (3) The idea of cache memory is based
       (a) on the property of locality of reference  
       (b) on the heuristic 90-10 rule  
       (c) on the fact that references generally tend to cluster  
       (d) all of the above
   
   (4) The number 362 in base 8 is
       (a) 255  (b) 363  
       (c) 472  (d) 552
   
   (5) The following number is in base 2.
       \[ 111001 \]
       What is its value in base 10?
       (a) 22  (b) 39  
       (c) 57  (d) 114
(6) The nand gates output will be low if two inputs are:
(a) 00   (b) 01
(c) 10   (d) 11

(7) The output of a logic gate is 1 when all its inputs are at logic 0, the
gate is either
(a) a NAND or an EX-OR   (b) an OR or an EX-NOR
(c) an AND or an EX-OR   (d) a NOR or an EX-NOR

(8) DeMorgan's first theorem shows the equivalence of
(a) OR gate and Exclusive OR gate.
(b) NOR gate and Bubbled AND gate.
(c) NOR gate and NAND gate.
(d) NAND gate and NOT gate

(9) How many two - input AND and OR gates are required to realize
\[ Y = CD + EF + G \]?
(a) 2,2.  (b) 2,3.
(c) 3,3.  (d) none of these

(10) Which of the following holds the ROM, CPU, RAM and expansion
cards?
(a) Hard Disk   (b) Floppy Disk
(c) Mother board  (d) None of the above

(11) K-map for half adder is of ______ variables.
(a) 2   (b) 3
(c) 4   (d) 5

(12) The 8085 processor is based upon a ______ pin dip.
(a) 40   (b) 45
(c) 20   (d) 25

(13) The o/p of half adder is in the form of
(a) Sum   (b) Carry
(c) Sum and Carry   (d) None of these
(14) Karnaugh map (K-map) technique provides a systematic method for simplifying ________.

(a) Multiplexers  (b) Logic gates
(c) Boolean expressions  (d) None of these

(15) How is a J-K flip-flop made to toggle?

(a) J = 0, K = 0  (b) J = 1, K = 0
(c) J = 0, K = 1  (d) J = 1, K = 1

2. Attempt any five of the following:

   (1) Explain SR Flip.
   (2) What is the function of Main Memory?
   (3) What is a Virtual Memory? How it differs from cache memory?
   (4) What do you understand by the term instruction code?
   (5) Define De Morgan's theorem.
   (6) Describe XOR Gate with its diagram.

3. Attempt any three of the following:

   (1) Show how to implement a full adder by using half adders?
   (2) Design a 2 bit counter using D Flip-Flop.
   (3) Describe the addressing mode of computer instructions.
   (4) Design a half-adder as a two-level AND-OR circuit.

4. Attempt any two of the following:

   (1) Design a 4-bit combinational circuit decremented using four full adders.
   (2) Differentiate between virtual and cache memory.
   (3) Design a 16-bit Multiplexer and De-Multiplexer.
5. Attempt any **one** of the following:

(1) Explain the different types of mapping procedures in the organization of cache Memory with diagram.

(2) Why read and write control lines in a DMA controller bidirectional? Under what condition and for what purpose are they used as inputs?
M. C. A. (Sem. I) (CBCS) Examination
January - 2012
MCA - CCA - 1002 : Computer Organization

Faculty Code : 003
Subject Code : 007102

Time : 3 Hours
[Total Marks : 70]

Q.1 Answer the following multiple choice questions.

(1) A radix \( K \) number system requires how many different symbols to represent the digits 0 to \( K-1 \)?
   (a) \( K \)
   (b) \( K - 1 \)
   (c) \( K + 1 \)
   (d) 1

(2) Which of the following number systems has exactly one representation for number 0?
   (a) Signed magnitude
   (b) 1's Complement
   (c) 2's complement
   (d) Excess 128

(3) In IEEE floating point formats how many bits are used to store exponent for a double precision floating point number?
   (a) 1
   (b) 8
   (c) 11
   (d) 15

(4) Which of the following gate is called an inverter?
   (a) AND
   (b) OR
   (c) NOT
   (d) XOR

(5) Which of the following gate is a universal gate??
   (a) AND
   (b) XOR
   (c) NOT
   (d) NAND

(6) Which of the following is not a type of a bus?
   (a) PCI
   (b) EISA
   (c) ISA
   (d) None of above

(7) Which of the following is effectively a nerve center that sends control signals to other units and senses their states??
   (a) Memory
   (b) Arithmetic and Logic Unit
   (c) Clock
   (d) Control Unit

(8) A non-inverting buffer has not which of the following signal?
   (a) A data input
   (b) A data output
   (c) A control input
   (d) A control output
Which of the following statements is true regarding to memory?
(a) A flip-flop and latch both function same
(b) Flip-flop is edge triggered and latch is level triggered
(c) Flip-flop is level triggered and latch is edge triggered
(d) Either of flip-flop and latch is a combinational circuit

Which of the following is not the addressing mode?
(a) Intermediate addressing
(b) Direct addressing
(c) Register addressing
(d) Immediate addressing

Which of the following circuit takes an n-bit number as input and uses it to select exactly one of the 2^n output lines?
(a) Multiplexer
(b) Encoder
(c) Demultiplexer
(d) Decoder

UART stands for
(a) Universal Asynchronous Retrieval Transmitter
(b) Universal Asynchronous Receiver Transfer
(c) Universal Asynchronous Receiver Transmitter
(d) Universal Asynchronous Retrieval Transfer

Locality of reference is related to which of the following memory?
(a) Main memory
(b) Auxiliary memory
(c) Cache memory
(d) Virtual memory

Which of the following indicates that the slave is ready to accept data from the master in Pentium II logical pinout?
(a) RS#
(b) DRDY#
(c) DUSY#
(d) TRDY#

Which of the following register contains the data to be written into or read out of the specified location?
(a) MAR
(b) MDR
(c) PC
(d) IR

Q.2 Attempt any five of the following

(1) Convert the given binary number 1001101001 into its equivalent decimal, octal and hexadecimal number.

(2) Find out the IEEE single precision floating point representation for a number 5.375.

(3) Simplify the following Boolean expression using karnaugh map and generate a circuit for it.
\[ \overline{A} \overline{B} \overline{C} + \overline{A} \overline{B} C + A \overline{B} C + A \overline{B} C \]

(4) Explain full adder with truth table.

(5) Explain fetch-decode-execute cycle.

(6) What is USB? Explain the goals and benefits of it.
Q.3 Attempt any three of the following.

(1) What is the task of ALU? Explain 1-bit ALU with circuit diagram.
(2) What is bus arbitration? Explain centralized and decentralized bus arbitration.
(3) What is decoder? Explain 3-to-8 decoder circuit.
(4) Explain the logical pinout of Pentium II.

Q.4 Attempt any two of the following.

(1) What is register? Explain universal register with circuit diagram.
(2) Explain the memory organization for a 4 X 3 memory with logic diagram.
(3) What is bus? List and explain different types of buses in brief and explain the organization of a computer system with multiple buses.

Q.5 Attempt any one of the following.

(1) What is flip-flop? Explain SR flip flop with circuit diagram in detail. Briefly discuss the race condition.
(2) Define addressing mode. List and explain each addressing in detail. Briefly explain cache and virtual memory.
1. Answer the following multiple choice questions: 15

(1) The Left Most Digit in Decimal Number System Called as
   (A) Most Significant Digit
   (B) Major Strong Digit
   (C) Main Subjective Digit
   (D) Mega Sensitive Digit

(2) A Binary Digit is called as
   (A) Byte
   (B) Bit
   (C) Nibble
   (D) None of above

(3) Binary Value of \( (163.875)_{10} \) is
   (A) \( (1010011.111)_{2} \)
   (B) \( (1010111.111)_{2} \)
   (C) \( (1010110.111)_{2} \)
   (D) \( (10101010.101)_{2} \)

(4) Calculate Binary Arithmetic Operation for :
   \( (1011)_{2} + (10010)_{2} = ? \)
   (A) \( (10110)_{2} \)
   (B) \( (10011)_{2} \)
   (C) \( (11101)_{2} \)
   (D) \( (001010)_{2} \)
(5) Calculate Binary Arithmetic Operation for:
\[ (00101010)_2 + (00000110)_2 = \]
(A) \( (00101010)_2 \)
(B) \( (0010)_2 \)
(C) \( (100)_2 \)
(D) \( (111)_2 \)

(6) Which Number system is not a positional number System?
(A) Binary
(B) Octal
(C) Roman
(D) Decimal

(7) Decimal Value for the given \((4057.06)_8\) is
(A) \( (2095.0937)_10 \)
(B) \( (209.37)_10 \)
(C) \( (101010.11)_10 \)
(D) \( (5093.7)_10 \)

(8) What is the Logic which controls a staircase light associated with two switch A and B located at the bottom and top of the staircase respectively?
(A) OR
(B) AND
(C) X-OR
(D) X-NOT

(9) How many NOR Gates requires to obtain AND Operation?
(A) 2
(B) 3
(C) 4
(D) 5

(10) Number of rows in the truth table of a 4-input gate is
(A) 4
(B) 8
(C) 12
(D) 16

(11) Which of the following gate called Inverter?
(A) AND
(B) OR
(C) NAND
(D) NOT

(12) ALU stands for
(A) All Language Unit
(B) Arithmetic and Language Unit
(C) Arithmetic and Legal Unit
(D) Arithmetic and Logical Unit
(13) The code used for labelling cells of the K map is
(A) Natural BCD
(B) Gray
(C) Hexadecimal
(D) Binary

(14) A flip-flop has two outputs which are
(A) Always 0
(B) Always 1
(C) Always complementary
(D) All of the above states

(15) A flip-flop can be made using
(A) AND, OR and NOT gates
(B) NAND Gates
(C) NOR Gates
(D) Any of the above

2 Attempt any five of the following: 15
(1) Explain NAND gate with its applications
(2) State the De Morgan's theorem for three variables in both the forms and give the proof for one by the method of perfect induction
(3) Perform the subtraction with unsigned decimal numbers by taking the 10's complement: 967-251
(4) What is ISA Bus?
(5) Explain USB in short. Give applications of USB
(6) Differentiate: Cache Memory v/s Main Memory

3 Attempt any three of the following: 15
(1) Explain Cache Memory and Virtual Memory
(2) Simplify the following Boolean Expressions:
   (A) \( A + B[AC+(B+C')D] \)
   (B) \((A+B')'(AB'+ABC)\)
(3) List applications of Combinational Circuit with its importance in Digital Equipments
(4) Write a short note on: Virtual Memory.

4 Attempt any two of the following: 15
(1) Why NAND and NOR Gates called as Universal Gates?
(2) Explain BCD counter with examples
(3) Design a counter, using three JK flip-flops X, Y and Z, which counts as 0, 7, 3, 2, 5, repeat.

5 Attempt any one of the following: 10
(1) Write a Brief Explanation of De-Multiplexer
(2) Explain D-Flip Flop and Compare it with SR Flip Flop.