

- Total Points: 100 + 25 (EXTRA CREDIT QUESTION)
- NO ELECTRICAL/MECHANICAL CALCULATING DEVICES ARE ALLOWED
- THE FINAL EXAM WILL NOT BE RETURNED
- TIME: 10 AM - 12:50 PM

NAME: _____ "ANSWER KEY"

SSN: _____

cdad abd abcab CABED

QUESTION 1: MULTIPLE CHOICE QUESTIONS. CIRCLE THE CORRECT ANSWER (Total Points: 25)

1. The equivalent octal number for 1101101_2 is:

- (a) 17_8 (b) 36_8 (c) 155_8 (d) 1231_8

2. The equivalent hexadecimal number for 108_{10} is:

- (a) 27_{16} (b) 54_{16} (c) $A8_{16}$ (d) $6C_{16}$

3. The logic circuit that produces a 1 at the output only when all its inputs are 0 is the

- (a) AND gate (b) OR gate (c) NAND gate (d) NOR gate

4. The Boolean expression $AB + AC + BD + CD$ can be simplified to equal

- (a) $(A+D)(B+C)$ (b) $AB+CD$ (c) $(A+B)(A+C)(B+D)(C+D)$ (d) $(A+B)(C+D)$

5. The binary numbers 10010111 plus 00101110 equals:

- (a) 10111111 (b) 01000000 (c) 11000001 (d) 11000101

6. A memory that can be read into and read out very fast is the:

- (a) RAM (b) ROM (c) $DRAM$ (d) $EEPROM$

(a) RAM

(d) ROM

(c) PROM

(e) EPROM

7. How many input combinations would a four-input logic gate have?

(a) Eight

(b) Sixteen

(c) Thirty-two

(d) Four

8. If inputs A and B are ANDed together, and then the result is ORed with C, the Boolean expression equation describing this operation would be:

(a) $Y=AB+BC$ (b) $Y=(A+B)C$ (c) $Y=AB+C$ (d) $Y=AB+AC$

9. Which of the following is controlled to switch one of several inputs through to one output?

(a) Multiplexer

(b) Comparator

(c) Demultiplexer

(d) Encoder

10. Which digital logic unit is used to perform arithmetic operations and logic functions?

(a) MPU

(b) ALU

(c) CPU

(d) ICU

TT FFT TF TFFLT T (1110 1011 1010), (1011 0001)₂ (27.5)₈ 1110011 101

11. Match the types of memory devices in Column A with their proper description in Column B.

Column A	Column B
(a) Semiconductor RAM	(C) 1. Has fuse links
(b) Semiconductor ROM	(A) 2. A volatile memory
(c) PROM	(B) 3. Programmed at the factory
(d) EPROM	(E) 4. A non-volatile RAM
(e) Magnetic core RAM	(D) 5. Can be erased with ultraviolet light

QUESTION 2: TRUE OR FALSE. (Total Points: 26)

2.

- T 1. The base or radix of a number system indicates how many symbols the system uses.
- T 2. The octal and hexadecimal number systems are multiples of the binary number system.
- F 3. With positive logic $0V=1$ and $+5V=0$.
- F 4. The Exclusive-OR gate will have an output of 1 when its inputs are 1.
- T 5. When the inputs to a NAND gate are connected together, the output responds as an inverter.
- T 6. A NOR gate can be connected to serve as an inverter.
- F 7. Negated inputs to an OR gate cause it to operate the same as a NOR gate.
- T 8. Negated inputs to an AND gate cause it to operate the same as an OR gate.
- F 9. The Boolean expression $\text{NOT} [(A+B)]$ is equal to $\text{NOT} [(A.B)]$
- F 10. A NAND gate with one input grounded will always produce a 0 at the output.
- F 11. The Boolean expression $\text{NOT} [(A)] + \text{NOT} [(B)]$ is equal to $\text{NOT} [(A)].\text{NOT} [(B)]$
- T 12. The 1's complement of 10011101 is 01100010
- T 13. An even parity generator will produce a 1 if the input data are odd.

QUESTION 3: Numericals. Show your work. (Total 25 Points)

1. Generate the Hamming code for $(11011010)_2$. Assume even parity ⁵
- $(11101011010)_2$

$$\begin{array}{r}
 2. \quad 11001010_2 \\
 - \quad \quad 11001_2 \\
 \hline
 10110001_2
 \end{array}$$

3. Convert 23.625_{10} to octal

$$(27.5)_8$$

4. Convert 231.72_{10} to binary

5. $(1110\ 0111.\underline{101})_2$
+ $2\ A\ E_{16}$
+ $A\ E\ F_{16}$
D9D

TILL THREE DECIMAL PLACES

Question 4: Write brief notes (3-4 relevant sentences) on each of the following
(Total 24 Points)

TRANSLATION VERSUS INTERPRETATION

RAID LEVEL 4

SYSTEM SOFTWARE VERSUS APPLICATION SOFTWARE

VON NEUMANN ARCHITECTURE

MICRO-PROGRAMMED VERSUS HARD-WIRED CONTROL UNITS

ADVANTAGES AND DISADVANTAGES OF BRANCH PREDICTION METHOD

RAMBUS DRAM

N-WAY SET ASSOCIATIVE CACHE

QUESTION 5: EXTRA CREDIT QUESTION. THIS QUESTION WILL BE GRADED ONLY IF QUESTIONS 1-4 HAVE BEEN ANSWERED (Total 25 Points)

1. Explain in detail, with diagram, the operation of a decoder (10 Points)
 2. Differentiate between a write-through cache and a write-back cache (5 Points)
 3. Differentiate between cache write-no-allocate policy and cache write-allocate policy (5 Points)
 4. Write a note on the advantages and disadvantages of a unified cache and a split cache (5 Points)
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