

Name: \_\_\_\_\_

Format: Open book, open notes. You may use a calculator if you wish, but note the requirement below.

To receive credit, you must:

- 1) show all work on computational problems,
- 2) sign the honor pledge at the end of the exam.

1. (6 pts) Convert the following binary numbers to their decimal equivalent.

a)  $1001_2$

b)  $111_2$

2. (6 pts) Convert each of the following octal numbers to their binary equivalent.

a)  $5_8$

b)  $171_8$

c)  $180_8$

3. (6 pts) Convert each of the following octal number to their base 10 equivalent.

a)  $5_8$

b)  $171_8$

c)  $180_8$

4. (6 pts) Convert each of the following base 10 numbers to their binary equivalent.

a)  $66_{10}$

b)  $4_{10}$

5. (6 pts) What is the value of the following sums? Assume all numbers are hexadecimal. Leave the sum in hexadecimal.

a) 
$$\begin{array}{r} 35 \\ + 652 \\ \hline \end{array}$$

b) 
$$\begin{array}{r} AA3 \\ + 3A \\ \hline \end{array}$$

c) 
$$\begin{array}{r} 8F8 \\ + 38 \\ \hline \end{array}$$

5. (6 pts) Perform the following subtractions. Assume all numbers are hexadecimal. Leave the answer in hexadecimal.

$$\begin{array}{r} \text{a) } 652 \\ - 35 \\ \hline \end{array} \qquad \begin{array}{r} \text{b) } AA3 \\ - 3A \\ \hline \end{array} \qquad \begin{array}{r} \text{c) } 8F8 \\ - 38 \\ \hline \end{array}$$

6. (6 pts) Convert the following numbers from hexadecimal to their binary equivalent.

a)  $1A66_{16}$

b)  $8002_{16}$

7. (6 pts) Does Alice (as discussed in class) pass the Turing test? Justify your answer. (Note that different answers from different class members are expected. What matters is your justification.)

8. (6 pts) What is similar about vacuum tubes, magnetic tape, and transistors that each has been used for computer memory?

9. (5 pts) Can the Latin alphabet be represented using a 6 bit code? Justify your answer.

10. (4 pts) Is the dashboard speedometer on your car analog or digital? (If you don't own a car, answer the question for most cars.) Explain why your answer is correct (since I haven't seen your car).

11. (4 pts) In the number 3.14159, identify the sign, mantissa, and exponent.

12. (5 pts) Represent the following string using run-length encoding.

aaaxxxxxxxxxxyyaaaayxxxxxxxx

13. (6 pts) Given the following Huffman encoding table, decipher the bit strings below.

Huffman Code	Character
00	A
11	E
010	T
0110	C
0111	L
1000	S
1011	R
10010	O
10011	I
101000	N
101001	F
101010	H
101011	D

a) 101010100010100010101011

b) 101001000100110000110

For each string, also explain how you decoded it.

14. (5 pts) Correct the errors in the following table from the text.

Real Value	Floating-Point Value
12001.00	$12001 * 10^0$
-120.01	$-12001 * 10^{-2}$
0.12000	$1200 * 10^{-5}$
-123.1	$-12310 * 10^2$
1555555555	$15555 * 10^3$

15. (4 pts) Why is ASCII not used for Russian text?

16. (5 pts) Why is a compression technique such as Huffman code useful for disk storage and for transmitting web page contents over the Internet?

17. (5 pts) Why might integer operations result in incorrect answers on a computer?

18. (6 pts) Convert  $2401_{16}$  to its decimal equivalent. Check your answer by converting your answer (in decimal) back to base 16. (No credit unless I can check your work.)

**Pledged:** I have neither given nor received help on this exam.

Signature: \_\_\_\_\_