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Solutions

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EECS 1520.03 COMPUTER USE: Fundamentals
Test 1 – Version A

Instructions:

- This is an in class examination, therefore examination rules are in effect.
- Fill in the box at the top of this page, and print your ID# at the top of each odd numbered page.
- Answer ALL questions.
- Time allowed is **50** minutes.
- Use of all electronic devices is **PROHIBIED**.
- There are **5** pages of questions in addition to the cover.
  Please count them.

Part	Value	Mark
A	5	_____
B	7	_____
C	2	_____
D	5	_____
E	5	_____
F	1	_____
G	15	_____
H	10	
Total:	***50***	_____

Part A [5 points]

For each of these concepts, write the generation in which it was first used into the blank, and circle the history (**hardware** or **software**) to which it belongs.

assembly languages	_____1	hardware / software
magnetic disks	_____2	hardware / software
spreadsheets	_____4	hardware / software
transistors used as memory	_____3	hardware / software
World Wide Web	_____5	hardware / software

Part B [7 points]

A pattern of binary digits can be interpreted in several different ways.
Show how the pattern **01101110** translates using each of the following interpretations.

unsigned integer	110
integer in 2's complement notation	+110
integer in excess notation	-18
Hexadecimal short form	6E
Octal short form	156
floating point notation	+3½
ASCII	n

Part C [2 points]

1. In EECS1520, how many of a student's test grades can be annulled?
   a) None
   b) Only Test 2
   c) Only Test 1
   d) 0, 1, or 2

2. At what point in the course can a student in EECS1520 annul a test grade?
   a) Before the test
   b) At the end of the term
   c) Immediately after the test
   d) Never

Part D [5 points]

1) The process of converting sound to digital data is called _____.
   a) digitizing
   b) reset
   c) encoding
   d) sampling
   e) reclocking

2) The process of correcting degradation to digital data is called _____.
   a) digitizing
   b) reset
   c) encoding
   d) sampling
   e) reclocking

3) _____ removes redundant information from within a frame of a video.
   a) Huffman encoding
   b) Keyword encoding
   c) Run length encoding
   d) Spatial compression
   e) Temporal compression

4) A discrete representation, breaking the information up into separate elements.
   a) analog data
   b) digital data

5) Data can be retrieved without any loss of the original information.
   a) lossless
   b) lossy

Part E [5 points]

This partial worksheet generates random values that can be mapped onto Heads or Tails.

Random_Bit	0	0	1	1	0	0	0	0
Heads_or_Tails	Heads	Heads	Tails	Tails	Heads	Heads	Heads	Heads

1. Write a **single** Excel formula that will generate each **Random_Bit** when copied to the other cells. [3]

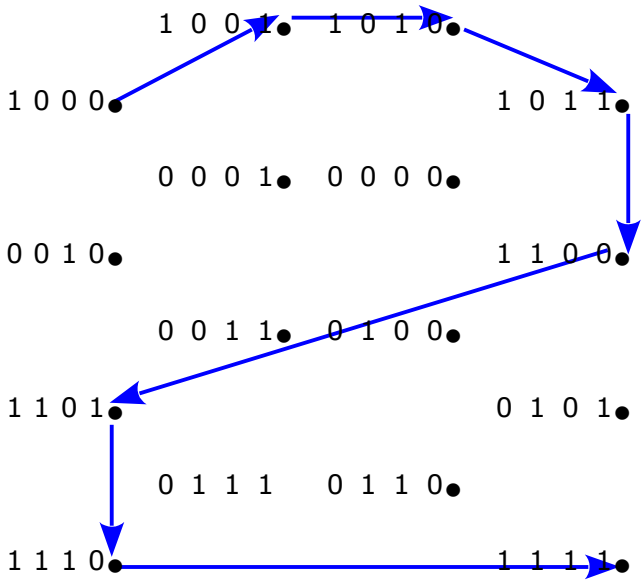
   = INT(RAND() * 2)

2. In Excel, a formula on one worksheet that reads data from another worksheet
   a) can only use relative addressing
   b) cannot use LOOKUP
   c) is called a "between the sheets formula"
   d) is called an "intersheet formula"
   e) is illegal

3. An Excel worksheet that contains instructions for the spreadsheet model would usually be called:
   a) Comments
   b) Parameters
   c) Graph
   d) Summary
   e) Main Data

Part F [1 point] – Join the Dots

The dots below are labelled (on the left) in **2's Complement** notation.
Connect the dots that have **negative** numbers as labels.
Start with the smallest value and proceed to the largest.



Part G [15 points]

1) In 8-bit, 2's complement notation, how many of the bit patterns represent negative numbers?[1]

128

2) Perform the following calculation in Binary:[1]

```
  0011.0001
+ 0001.0011
  0100.0100
```

3) Express the above answer as a proper fraction in decimal.[1]

4¼

4) Show how to encode this value in 8-bit binary Floating Point notation.[1]

Not possible! 011110001 is 9 bits
Award a mark for this, or 01111000, or 01111001, or for saying "not possible".

5) Show how a computer would use 8 bit binary notation to compute the following. [5]
49 / 23

23 converts to	00010111	
So -23 is	11101001	1
49 converts to	00110001	1
Add 49 and -23	1 00011010	1
The remainder is larger than the divisor so add -23 again	11101001	
	10 00000011	2

6) Perform the following calculation in Binary.[6]
25 * 36

= 25 * (32 + 4)		1
= 25 * 2^5 + 25 * 2^2		1
25 converts to	11001	1
*2^5	1100100000	1
*2^2	1100100	1
Add them	1110000100	1

Part H [10 points] – Short!! Answer

1) If the "*" is the flag character in a run-length encoding scheme, how would the following string be compressed?

XXXXXXXYYYYAAABBBBZZ

*X7*Y4AAA*B4ZZ

2) What is the compression ratio achieved by this process?

14/20 or .7 or 70%

3) Using the same run-length encoding scheme, unpack the following:

XX*Y8XX*14XX

XXYYYYYYYYXX1111XX

4) Use the following Huffman alphabet to decode the string.

a = 00 r = 1111 d = 110 e = 1110 c = 01 t= 10

11110010111000010010010

rateatcat

5) Using the same Huffman alphabet, encode the following:

"crate"

01111100101110

6) What compression ratio was achieved by this encryption?

Original size: 5 characters @ 8 bits each = 40 bits

14/40 or .35 or 35%

7) What is the word that refers to the number of pixels used to represent a picture?

resolution

8) Our retinas have three types of colour photoreceptor cells that respond to different sets of frequencies. To what colours do the photoreceptor categories correspond?

red, green, blue

9) The storage of image information on a pixel-by-pixel basis is called

raster graphics

10) If an image's size is 100 X 250 pixels, and is stored in Hi-Color format, how many bytes of memory are needed to store the image without compression?

125 * 200 = 25,000 pixels * 2 bytes/pixel = 50,000 bytes