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Set:\_\_\_\_\_\_\_C\_\_\_\_\_\_

**ASSIGNMENT 1 – 31 MARKS**

**Due:** Start of class, Thursday September 22nd (for set A), Monday September 26th (for set B and Set C)

This is how I mark this assignment:

50 percent: I will scan all the questions to see they are solved or not. This part includes the question in the next part.

50 percent: I select one or two questions randomly and mark them in detail. If you didn’t submit that specific question, you will lose this 50 percent, even if all other questions are answered correctly.

|  |  |
| --- | --- |
|  |  |
| ♦ | **All work must be done individually. Any evidence of copying will result in zero for all involved.** |
| ♦ | To receive credit, your answers must be neat and legible. Add brief explanatory comments as necessary to make sure your |

answers are clear and unambiguous to the grader. **When you solve a problem, show all the steps as is done in class**.

**Place all answers on THIS sheet and where needed attach your work showing all intermediate steps for full credit.**

1. [12 marks] Convert each of the following numbers from the given base to the other three bases listed: (attach work showing intermediate steps)



|  |  |  |  |
| --- | --- | --- | --- |
| **Decimal** | **Binary** | **Hexadecimal** | **Octal** |
| 1812.217187510 | 11100010100.00110112 | 714.3716 | 3424.1578 |
| 150.187510 | 10010110.00112 | 96.3 | 226.148 |
| 1720.648437510 | 11010111000.10100112 | 6B8.A616 | 3270.5148 |
| 282.87510 | 100011010.1112 | 11A.E16 | 432.78 |

**For work shown refer to below (p6-8), order from rows (1-4) and bases (a-c) example: 10010110.00112 to hexadecimal would be 2c).**

1. [4] Perform the following additions and subtractions. Be sure to show all carries/borrows explicitly.

(631)8  (65𝐸𝐸2. 𝐶𝐶)16

* 1. b.

+ (757)8 − (𝐷𝐷9𝐴𝐴. 𝐶𝐶)16

= (1610)8 (58148)16

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1. [4] According to Wikipedia, Donald Knuth, author of The Art of Computer Programming and winner of the Turing Award, was born in January of 1938. Calculate how many years old Donald Knuth would be in 2018 using binary arithmetic:

201810 = 111 1110 0010 2

193810 = 111 1001 0010 2

Difference = age = 101 0000 2

= 80 10

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1. [4] Convert the following decimal numbers to binary. Show repeating digits with a correctly positioned overbar.

[For Part (b), your work must show that you’ve taken meticulous account of the fact that the decimal number shown has digits repeating without end.]

* 1. 0.45 b. 0. 142857 = 

= =

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1. [3] As seen in lectures and above, some numbers that have a finite number of digits in base 10 (decimal) have a non-terminating expression in base 2 (binary). Is it possible that a number having a **non-terminating** expression in base *b*1, will have a **terminating** expression in base *b*2, where ***b*1 > *b*2**?

If it **is** possible, give an example. If it is **not** possible, explain why not.

I believe it is not possible because of how we convert decimal values between bases. I’ll use converting 1/7, as we’ve shown that is non-terminating, from base 10 to base 2 as an example. When converting 1/710 to base 2 the fraction is multiplied by 2. Because it is a non-terminating expression the result is also non-terminating. No matter how many times it is multiplied the result will always be a non-terminating value. In other words, an infinite number will always be infinite in another base following the rule ***b*1 > *b*2.**

1. [4] Determine the base *b. Demonstrate how you can get the value of b from basic principles rather than by trial and error.*
   1. (423)*b* = (509)10 b. (43)*b* x (31)*b* = (2433)*b*

B = 11 b = 5

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WORK FOR 1):

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