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MATH18584 Fundamentals of Computer Mathematics

- Assignment #1
- This assignment will be graded out of 30
- This assignment is to be completed individually. Assignments copied in whole or in part will receive a grade of ZERO.
- You **must** show your work for full marks!
- Answers may only be submitted in the following formats:
  - Microsoft Word Document (.docx)
  - Adobe PDF Document (.pdf)
  - Do not submit external links. Scanned documents need to be legible and in pdf format.

1. Evaluate the following signed binary numbers. (3 marks each)

a)
```
   01000100
 + 00101100
   01110100
```

b)
```
   01110110
 - 00111101
     111001
```

c)
```
   11011100
 - 00101110
   10101110
```

2. Solve. (2 marks each)

a)
```
   A459
 + 4CF6
   F14F
```

b)
```
   8B3
 - 6C4
   20F
```

3. Convert the following numbers. Show all your steps. (2 marks each)

a) 146_{dec} to binary

$146 - 2^7 = 18$

$18 - 2^4 = 2$ ∴ $146_{dec} = 10010010$

$2 - 2^1 = 0$

b) $5FA63_{hex}$ to binary

5   F   A   6   3   hex
↓   ↓   ↓   ↓   ↓

∴ $0101\ 1111\ 1010\ 0110\ 0011_{bin}$

4. Natasha would like to buy a car that costs $57C6_{hex}$ dollars. She has $20,000 in the bank and her brother will give her 100110100111_{bin}. Can she afford the car? (Convert all numbers in hexadecimal to solve) (3 marks)

$20\,000 \div 16 = 1250$, R0

$1250 \div 16 = 78$, R2

$78 \div 16 = 4$, RE

$4 \div 16 = 0$, R4

∴ $= 4E20_{hex}$

```
1001 1010 0111 bin
 9    A    7   hex
```

Natasha's $ = 4E20 + 9A7
= $57C7_{hex}$

∴ Natasha can afford the car because $57C7_{hex} > 57C6_{hex}$

5. Which of the following is a negation for "Jim is inside and Jan is at the pool?" **Explain.**

(2 marks)

(a) Jim is inside or Jan is not at the pool.
(b) Jim is inside or Jan is at the pool.
(c) Jim is not inside or Jan is at the pool.
(d) Jim is not inside and Jan is not at the pool.
(e) Jim is not inside or Jan is not at the pool.

c) because Jim is not inside to negate and Jan is not at the pool to negate the statement. 'And' remains.

6. Find the truth value of each of the expressions below, using the truth values shown. Show all your steps.

(2 marks)

$$F * \sim(E * D) \longleftrightarrow \sim(D * E + F) * D, \text{ where } D = 1, E = 0, F = 1$$

$$1 * \sim(0 * 1) \longleftrightarrow \sim(1 * 0 + 1) * 1$$
$$1 * \sim(0) \longleftrightarrow \sim(1) * 1$$
$$1 \longleftrightarrow 0$$
$$0$$

7. Using the Identities and Laws of Boolean Algebra, simplify the following expressions. List the specific law used for every simplification.

(2 marks each)

b) $AB(\sim C+1) + A(C+1)$ T3

a. $\sim(\sim B * A + \sim B) + A$

b. $A * B * \sim C + A * B + A * C + A$

a) $\sim(\sim B(A+1)) + A$ T3
   $\sim(\sim B(1)) + A$ T7
   $B + A$ T10

8. Evaluate using the equivalent binary numbers:
(-6) - 5

(2 marks)