COS 126	General Computer Science	Spring 2017

Written Exam 1 Solutions

1. **Object-oriented programming.**

   L M H D G J C E

2. **Debugging.**

   bug

- [x] `public ~~salute the~~ class ~~of 2017~~ IntegerFrequencyTable {`
- [ ] `    private int min;`
- [ ] `    private int max;`
- [x] `    private int[] freq ~~= new int[n]~~;`
- [x] `    public ~~void~~ IntegerFrequencyTable(int min, int max) {`
- [x] `        int n = ~~this.~~max - ~~this.~~min;`
- [x] `        ~~int[]~~ freq = new int[n];`
- [ ] `        this.min = min;`
- [ ] `        this.max = max;`
- [ ] `    }`
- [x] `    private ~~static~~ void validate(int val) {`
- [x] `        if (val <= min || val >= max)`
- [ ] `            throw new IllegalArgumentException();`
- [ ] `    }`
- [ ] `    public void increment(int val) {`
- [ ] `        validate(val);`
- [x] `        ~~return~~ freq[val - min]++;`
- [ ] `    }`
- [ ] `    public int frequencyOf(int val) {`
- [x] `        validate(~~int~~ val);`
- [ ] `        return freq[val - min];`
- [ ] `    }`
- [ ] `}`

3. **Linked structures.**

   CCDDFEB

   Alternative correct answers are CCDDEEB, CCEDEEB, CCEDFEB, and EEDDCCB.

```
Node x = first.next;
first.next = x.next;
x.next = x.next.next;
first.next.next = x;
```

4. **Properties of sorting algorithms.**

   B A A C D

5. **TOY.**

   (a) -40

   (b) `1201 2210 3211 4201`

   (c) `2201 8201 A201`

6. **Theory of computing.**

   B C A A A C B B D

7. **Powers of 2.**

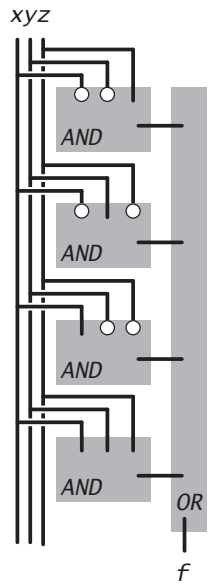
   F K D D E/G M N

8. **Circuits.**

yes ● *no* ○

x	y	z	f
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

yes ● *no* ○



yes ● *no* ○

yes ● *no* ○

$f = x \wedge ((x \wedge y) \wedge (x \wedge z))$

The $\wedge$ operator is commutative and associative, so the order of the terms and parentheses are irrelevant. Also, $x \wedge x = 0$ and $0 \wedge y = y$.

yes ● *no* ○

$f = xyz + xy'z' + x'yz' + x'y'z$

yes ○ *no* ●

```
public static boolean f(boolean x, boolean y, boolean z) {
    if (x && y) return z;
    if (x || y) return !z;
    return !z;
}
```

Returns the wrong value whenever `x` *and* `y` *are both* `false`.