COP 4020 Programming Languages – Fall 2016
Midterm Exam on 10/20/2016
Instructor: Dr. Pawel Wocjan

First name: _____

Last name: _____

PID: _____

Problem 1: ____ / 10

Problem 2: ____ / 5

Problem 3: ____ / 5

_____

Total: ____ / 20

Problem 1:

Each of the 10 subproblems is worth 1 point.

1. Give a short definition of higher-order functions.

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_____

2. Give a short definition of persistence.

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3. Define a polymorphic binary tree using the keyword `data`.

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4. Evaluate `filter (\x -> even x && odd x) [1,2,3,4]`

_____

5. Evaluate `zip [1..3] ['a'..'z']`

_____

6. What is the signature of `map`?

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7. What is the signature of `filter`?

_____

8. What is the signature of the partially applied function `zip ['a'..'z']`?

_____

9. What is the signature of the function `flip`, which flips the first input and second input of a general binary function?

_____

10. Evaluate `foldr (++) [] ["Haskell","is","fun!"]`

_____

Problem 2:

Implement the function `zipWith`. You are given its signature to remind you how this function works.

```
zipWith :: (a -> b -> c) -> [a] -> [b] -> [c]
```

Problem 3:

Implement the function `takeWhile` and give its **polymorphic** signature. Two examples of how this function works are given below:

```
takeWhile even [2,4,6,7,10,12] ~~> [2,4,6]

takeWhile odd [2,4,6,7,10,12] ~~> []
```