

## Functional Programming – Take Home Exam – Part1

### Introduction

In this part we have calculated the Sundays in a given time period such as between 1 Jan 1901 and 1 Jan 2000 Aka 20<sup>th</sup> century. In order to accomplish that following functions are constructed

- **dayOfWeek**: takes 3 Integer (which represent a specific date) and return an Integer which represents day of the week (starts from the Saturday as 0 to Friday as 6). In order to calculate the day of the week function calls **zellerCong** helper function which is a realization of Zeller's Congruence function
- **Sundays1**: by the help of recursive helper function **Sundays'** it calculates how many Sundays from start date to end date. **Sundays'** function cumulatively calculates Sundays till the given date (from starting date given globally by Sundays1 function). **Sundays'** function recursively calls itself for the next month's first day date and check is it Sunday or not via **dayOfWeek** function
- **Sundays1tr**: this function is the tail recursive version of the Sundays1 function this accomplished by passing an accumulator (which starts from 0) to the helper function
- **Leap**: calculates given year (integer) is leap year or Not by the simple leap year logic
- **daysInMonth**: maps given month to the corresponding day value via pattern matching
- **Sundays2**: Calls an tail recursive Sundays2' function, this function takes a starting weekday and an accumulator(which records the number of sundays). Then recursively add the number of days in that month so that it can calculate the corresponding weekday of the first day of next month. If it's sunday increase accumulator
- **getFunction**: takes a string which represents the desired function's name. And return the desired number of Sundays calculation function according to.

### 8. Q)

since  $365 \% 7 = 1$  every 365 days dayOfWeek advances 1 day

according to the leap year logic # of leap years is 91 ( $100 - 10 + 1 : 4 \rightarrow 100, 40 \rightarrow 10, 400 \rightarrow 1$ )

Thus in 400 years dayOfWeek will be advance  $(400 + 91) \% 7 = 1$  days **Conc: not integer**