MCN 7105 STRUCTURE AND INTERPRETATION OF COMPUTER PROGRAMS
Monday 7th October 2024

Mid Semester Coursework

Instructions

1. Submit your solutions via MUELE by Friday 25th October 2024
2. This is an individual assignment
3. Please submit one source code file. Include your student details in the file e.g.,

```
;MCN 7105 Assignment 01
;Student name:
;Reg. No.
;Programme (MDCSE; MCS; PDGCSE; PGDCS):
```

Questions

1. Develop data and structure definitions for school employees. An employee is one of

   - **principal** with properties of monthly salary, office number, and a symbol represting the diploma or degree earned by the principal;
   - **teacher** with properties of monthly salary, room number, and a symbol represting the diploma or degree earned by the teacher;
   - **assistant** with properties of hourly wage and number of hours worked within a pay period.

   The payroll office needs to compute various taxes before printing a paycheck. Develop the procedure *tax*, which takes an employee structure and a tax rate and returns the amount of tax for the pay period (per month for principals and teachers and the hours worked for an assistant).

2. Develop data and structure definitions for trains. A train is one of

   - **commuter**, which has the properties: number of cars, number of passengers per car, and a boolean determing whether this particular train makes all stops;
   - **amtrak**, which has the properties: number of cars, number of passengers per car, and a symbol designating the type of train as 'Express, 'Local, or 'Limited;
   - **subway**, which has the properties: number of cars, number of passengers per car, and a symbol representing the color of the train.

   Develop the procedure *hold-all?* that, given a train and a number of passengers, produces `true` if the train could contain them all and `false` if not.

3. Develop data and structure definitions for a collection of 3D shapes. The collection includes

   - **cubes** whose relevant property is the length of an edge;

- **prisms** which are rectangular solids and whose relevant properties are length, width, and height;
- **spheres** whose relevant property is the radius.

Develop the function *volume*. The function consumes a 3D shape and produces the volume of the object.

The volume of a cube is the cube of the length of one of its edges. The volume of a prism is the product of its length, width, and height. The volume of a sphere is 4/3 * PI * r^3.

4. Use the following data and structure definitions to solve this problem.

   A Document-summary is one of

   - `(make-letter Symbol Symbol Symbol)`
   - `(make-memo Symbol Symbol Symbol Symbol)`
   - `(make-resume Symbol Symbol Boolean)`

   where

```
(define letter (to date signature))
(define memo (from to date subject))
(define resume (name date sent?))
```

   Develop the procedure *from*, which consumes a Document-summary and produces a symbol representing the author of the document (use the `signature` property of a letter, the `from` property of a memo, and the `name` property of the resume).

~~Good Luck~~