CS 2500/Accelerated Exam 0—Fall 2018

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- The exam is a **one-hour** exam.

- We will not answer questions during the exam. If you believe a problem statement is ambiguous, choose *any* non-trivial interpretation.

- Write down the answers in the space provided, including the back of the given spaces and pages marked "intentionally left blank".

- You may use the paper copy of the book, your notes, and design-recipe cards.

- You may *not* use any electronic gadgets (for example, watches, google glasses, phones, tablets, laptops). Any use of an electronic gadget will lead to immediate expulsion from the exam and class.

- You may use all the definitions, expressions, and functions found in BSL, especially those suggested in hints. Define everything else.

- The phrase "design a function" means that you should apply the function design recipe. You may write "c-e" as shorthand for `check-expect.`

- Basic test-taking advice: Before you start answering any problems, read *every* problem, so your brain can be thinking about the harder problems in the background while you knock off the easy ones.

Problem	Max. Points
1	6
2	16
3	8
Total	/ 30
Extra Credit	4

Problem 1 (6 points)

Consider the following data definition and template. Circle all errors in the template and annotate each one with a number, e.g., (1), (2), etc. Then, in the space below, write the number and next to it the correct code that should appear in the corresponding circled area of the template, and also write one sentence explaining why that circled part of the template is incorrect.

```
; A GeoCoord is one of:
; - Location
; - PositiveNumber
; - NegativeNumber
; interpretation It represents either a location
on the Earth's surface, an altitude in the air
(positive number), or a depth in the sea (neg-
ative number).

(define-struct location [latitude longitude])
; A Location is a (make-location Number Number)
; interpretation A (make-location lat long) is a
coordinate on the Earth's surface.

; Templates
(define (geocoord-template gc)
  (cond [(location? gc) ...]
        [(number? gc) ...]
        [else ...]))

(define (location-template loc)
  (... (location-latitude loc) ...
       (location-longitude loc) ...))
```

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Problem 2 (16 points)

Consider the following data definition (where NNN is a non-negative real number).

```
(define-struct pet [species age weight])
; A Pet is a (make-pet Species NNN NNN)
; interpretation A (make-pet s a w) represents a
pet, where s is the species of animal, with age
a in human years, and weight w in pounds.

; A Species is one of:
; - "dog"
; - "cat"
```

(a) Provide two examples of *Pet*s and give templates for the above data definitions.

(b) Design the function `pet-years`. It consumes a *Pet* and returns a sentence with the pet's age in the animal's own years (i.e., dog years or cat years). The sentence should be of the form `"N in animal years"` where `N` is the age in dog years or cat years. For instance, for a pet dog whose age is 10 in human years, `pet-years` should produce `"70 in animal years"`.

Domain knowledge

- One human year is 7 dog years.
- One human year is 4 cat years.

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Problem 3 (8 points)

In your new job at *ABC Music*, you've been asked to develop an application that maintains information about music albums. You will need to track an album's title, genre, and artist. The only genres of interest to the company are pop, jazz, and hiphop. For each artist, we would like to know the artist's name and birth year.

Design a data representation (i.e., data definition with interpretation) for albums and any other information your application will need to keep track of.