

# CS 2316 Exam 3

## Practice

Name (print clearly): \_\_\_\_\_

T-Square ID (gtg, gth, msmith3, etc): \_\_\_\_\_ Section (e.g., B1): \_\_\_\_\_

Signature: \_\_\_\_\_

- Failure to properly fill in the information on this page will result in a deduction of up to 5 points from your exam score.
- Signing signifies you are aware of and in accordance with the **Academic Honor Code of Georgia Tech** and that you will not discuss this exam with other students.
- Calculators and cell phones are NOT allowed.
- Answers containing Python code must use valid Python code, including case-sensitivity, syntax, and API correctness.

Question	Points per Page	Points Lost	Points Earned	Graded By
Page 1	15	-	=	
Page 2	15	-	=	
Page 3	30	-	=	
Page 4	25	-	=	
Page 5	25	-	=	
TOTAL	110	-	=	

1. **Multiple Choice** Circle the letter of the best answer.

[3] (a) Given this definition:

```
d = {
    "people": {
        "person": [
            {
                "firstName": "Alan",
                "lastName": "Turing",
                "professions": {
                    "profession": ["Computer Scientist", "Mathematician",
                                   "Computer Scientist", "Cryptographer"]
                }
            },
            {
                "firstName": "Stephen",
                "lastName": "Hawking",
                "professions": {
                    "profession": ["Physicist", "Comedian"]
                }
            }
        ]
    }
}
```

[3] (b) Which of the following returns the second profession of Stephen Hawking (whose value would be 'Comedian')?

- A. `d['people']['person'][1]['professions']['profession'][1]`
- B. `d['people']['person'][1]['professions']['profession']`
- C. `d['people']['person'][1]['professions']['Comedian']`

[3] (c) What's the type of `d['people']['person'][1]['professions']['profession']`

- A. tuple
- B. dict
- C. list

[3] (d) What's the value of `d['people']['person'][0]['firstName']`?

- A. 'Hawking'
- B. 'Stephen'
- C. 'Turing'
- D. 'Alan'

[3] (e) Which of the following Python expressions opens a file for reading as text?

- A. `open "season"`
- B. `open("borders", 'wb')`
- C. `open("sesame", 'r')`
- D. All of the above

2. **Multiple Choice** Circle the letter of the best choice.

- [3] (a) The fundamental data abstraction in relational databases is the table.  
A. True  
B. False
- [3] (b) In order for a foreign key in one table to reference a primary key in another table, it must have the same name.  
A. True  
B. False
- [3] (c) An author can write many books and a book can have many authors. What kind of cardinality relationship exists between authors and books?  
A. many to many  
B. one to one  
C. one to many
- [3] (d) The CSV data model can encode any data model that the XML data model can.  
A. True  
B. False
- [3] (e) Which of the following is **not** well-formed XML?  
A. <a> <b> c </b> </a>  
B. <a> <b> <c> </b> </a>  
C. <a> <b> <c/> </b> </a>  
D. <a> <b> <c> d </c> </b> </a>

### 3. Short Answer

- [5] (a) What command would you type in iPython to find your present working directory?
- [5] (b) How would you find out what the `%prun` command does in iPython?
- [5] (c) Write an expression that creates a NumPy array of 5 integers. Assume `import numpy as np` has been done.
- [5] (d) Write an expression that creates a 3 x 3 NumPy array of integers. Assume `import numpy as np` has been done.
- [5] (e) Given a dictionary `d` created by `d = dict(zip(['a', 'b', 'c', 'd'], range(4)))`, write a statement that creates a Pandas Series from `d` and assigns it to the variable `data`. Assume `import pandas as pd` has been done.
- [5] (f) After creating the series `data` above, what would `data['b']` return?

#### 4. Short answer

Given:

```
salary = {"Data Scientist": 110000,
          "DevOps Engineer": 110000,
          "Data Engineer": 106000,
          "Analytics Manager": 112000,
          "Database Administrator": 93000,
          "Software Architect": 125000,
          "Software Engineer": 101000,
          "Supply Chain Manager": 100000}
openings = {"Data Scientist": 4184,
            "DevOps Engineer": 2725,
            "Data Engineer": 2599,
            "Analytics Manager": 1958,
            "Database Administrator": 2877,
            "Software Architect": 2232,
            "Software Engineer": 17085,
            "Supply Chain Manager": 1270}
```

- [5] (a) Write a statement that assigns to `salary_data` a Panda series with the data from the `salary` dictionary.
- [5] (b) After the assignment above, what is the value of `salary_data[Software Engineer]`
- [5] (c) Write a statement that assigns to `jobs` a Panda DataFrame from the data in the `salary` and `openings` dictionaries with '`salary`' as the heading for the salary column and '`openings`' as the heading for the openings column.
- [5] (d) Write an expression that returns all the jobs in the `jobs` DataFrame with salary greater than 100000.
- [5] (e) Write an assignment statement that adds a column to `jobs` called '`6 figures`' whose values are `True` for jobs with salaries greater than 100000 and `False` otherwise.

## 5. Short Answer

Assuming a database with the following schema is stored in an SQLite3 database file named `dorms.db`,

```
create table dorm (
    dorm_id integer primary key autoincrement,
    name text,
    spaces integer
);
create table stud (
    stud_id integer primary key autoincrement,
    name text,
    gpa float,
    dorm_id integer references dorm(dorm_id)
);
```

- [15] (a) write a snippet of Python code that queries the database and stores in a variable named `dorm_assignments` a list whose elements are tuples, where each tuple contains a student name and the name of the dorm that student lives in, e.g., tuples like `('Cartman', 'Armstrong')`. Assume the `sqlite3` module is imported.
- [5] (b) Write a single Python expression that creates a tuple mapping student names to the names of the dorms they live in using the `dorm_assignments` list created above.
- [5] (c) Write a single Python expressions that creates a list of students in Armstrong using the `dorm_assignments` list created above.