College of Engineering, Construction and Living Sciences
Bachelor of Information Technology
IN628: Programming 4
Level 6, Credits 15

Practice Theory Exam

Exam Topics

C++

- Pointers - you need to know the value after execution & draw a diagram to show your working
- Linked list - delete from the start, middle & end
- Access modifiers - public, private & protected
- Inheritance & finite state machines - you need to know how to draw a diagram for each
- Optimisation - collision detection

Python

- Basic data structures - list, tuple, set, dictionary, stack & queue
- Comprehensions - list & set
- Lambda
- Map, filter & reduce
- Iterator & generator - you need to know how to create one
- In-built functions - enumerate, reversed, slide, sorted, vars & zip
- Exceptions
- List slicing

Design Patterns

- Creational, structural & behavioural - you need to know the differences
- Strategy
- Observer
- Factory
- Builder
- State

Ruby

- Review the 02-assessment-ruby-checklist document

C++

Question 1

Consider the following code:

```
int a = 5;
int *b = &a;
*b = 6;
a = 7;
```

(a) After execution, what is the value of a?

(b) What is the value of b*?

Question 2

In pseudocode, describe how you would delete the middle node in a **single linked list**. Note: the linked list has an odd number of nodes.

Question 3

Assume a class called **NPC** with the following fields declared in **NPC.h**:

```
private int attack;
protected int defence;
public int Health;
```

If you declare a new class **Enemy** which descends from **NPC**, which of the following are legal statement(s) in methods declared in the **NPC**?

(a) health = 25;

(b) defence = 25;

(c) Strength = 25;

In a method of my **Controller** class I have created an instance of **Enemy** class and assigned its address to a managed pointer **monster**. If neither the **NPC** nor **Enemy** classes declare any properties, which of the following are legal statement(s) in methods declared in the **Controller** class?

(a) monster->health = 35;

(b) monster->defence = 35;

(c) monster->Strength = 35;

Question 4

In a pet shop simulation game, you sell puppies, kittens, fish and turtles. All your animals can be fed and sold. Puppies and kittens can be played with, but fish and turtles cannot. Puppies can also be walked. Sketch a diagram of the class architecture you would use for this game, showing the methods defined in each class (don't write any code). Be sure to clearly indicate any inheritance relationships.

Python

Question 5

Consider the following code:

```
numbers = [1, 2, 3, 4, 5]
squares = []

for n in numbers:
    squares.append(n ** 2)

print(squares) # [1, 4, 9, 16, 25]
```

Rewrite the following lines to use a **list comprehension** to display the expected output.

```
for n in numbers:
    squares.append(n ** 2)
```

Question 6

Consider the following code:

```
class Count:
    def __init__(self, low, high):
        self.low = low
        self.high = high

    def __iter__(self):
        return self

    def __next__(self):
        pass

def main():
    count_to_ten = Count(0, 10)
    print(list(count_to_ten)) # [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

if __name__ == '__main__':
    main()
```

(a) Implement the **__next__** special method to display the expected output.

Question 7

Describe what the **enumerate** function does.

Question 8

When executed, what is the output for the following list slice operations?

```
numbers = [10, 20, 30, 40, 50, 60, 70, 80, 90, 100]
print(numbers[3:7])
print(numbers[-3:])
```

Design Patterns

Question 9

Consider the following problem: **a clothing company that sells genuine & fake handbags**. Each handbag is made up of several parts including the body, strap, accessories, etc. Generally, the more expensive the bag, the more parts it will have. Obviously, each bag will have a different list of parts. For example, a handbag may have a plastic body, full grain leather strap & a sterling silver logo metal plate. Another handbag may have a leather body, plastic strap, but no sterling silver logo metal plate. You decide to create a small program which constructs a handbag. Which design pattern would best suit this problem?

Ruby

Question 10

Describe what the following code snippet is doing.

```
%w{Amsterdam Berlin Cromwell}.reverse_each do |city|
    puts city.reverse
end
```

Question 11

How do you iterate over the individual characters in a string using idiomatic Ruby?