Sample Paper 1

Python Programming Exam (Advanced)

Name: _____ Roll No: _____

Section: _____ Date: _____ Max Marks: 50

Part A: Code Snippets and Errors [15 marks]

1. [5 marks]
Given a list of tuples, write a code snippet to sort the list by the sum of elements in each tuple. You must use a lambda function as the key for sorting.

Input:
```
lst = [(2, 3), (1, 5), (4, 1)]
```

Output:
```
[(4, 1), (2, 3), (1, 5)]
```

(Bonus: -0.5 marks for every extra line of code beyond 3 lines.)

2. [5 marks]
The following code throws an error. Identify the error and fix it in exactly 3 lines of Python code.

Code:
```
def merge_dicts(dict1, dict2):
    for key in dict1:
        dict1[key] += dict2[key]
    return dict1

d1 = {'a': 1, 'b': 2}
d2 = {'b': 3, 'c': 4}
print(merge_dicts(d1, d2))
```

(Marks distribution: 2 marks for error identification, 3 marks for fixing.)

3. [5 marks]
Write a Python one-liner to extract all the unique vowels from a given string, preserving the order in which they appear.

Input:
```
'Programming is amazing'
```

Output:
```
['o', 'a', 'i']
```

(Full marks only for a one-liner solution.)

Part B: Output Prediction [10 marks]

4. [2 marks]

Predict the output of the following recursive function:

```
def mystery(n):
    if n == 0:
        return 0
    return n + mystery(n // 2)

print(mystery(10))
```

5. [3 marks]

Consider the following code snippet:

```
def f(s):
    result = []
    for i, c in enumerate(s):
        if c.isdigit() and int(c) % 2 == 0:
            result.append((i, int(c)**2))
    return result

print(f('a1b2c34'))
```

What is the output?

6. [5 marks]

You are given the following class definitions. Predict the output and explain why:

```
class A:
    def __init__(self, x):
        self.x = x

    def show(self):
        print(self.x)

class B(A):
    def __init__(self, x, y):
        super().__init__(x)
        self.y = y

    def show(self):
        print(self.x + self.y)

obj = B(10, 5)
obj.show()
```

Part C: Algorithmic Coding [15 marks]

7. [5 marks]

Write a function that takes a dictionary as input and returns a list of all keys whose

corresponding values are prime numbers.

Input:
```
d = {'a': 2, 'b': 4, 'c': 5, 'd': 10}
```

Output:
```
['a', 'c']
```

8. [5 marks]
Write a Python function to determine if a string is a valid palindrome, ignoring spaces, punctuation, and capitalization. You must implement this using recursion.

Input:
```
'A man, a plan, a canal, Panama'
```

Output:
```
True
```

9. [5 marks]
Implement a function to read a text file and print the top 3 most frequently occurring words along with their frequencies. Ignore case and punctuation.

(Marks distribution: 3 marks for correctness, 2 marks for handling edge cases.)

Part D: Advanced Object-Oriented Programming [10 marks]

10. [5 marks]
Design a class BankAccount with the following features:
- Private attributes account_number and balance.
- A method deposit(amount) to add to the balance.
- A method withdraw(amount) to subtract from the balance, ensuring the balance doesn't go negative. Raise an exception otherwise.
- A __str__ method to display the account details.

Write the full implementation and a test case to demonstrate functionality.

11. [5 marks]
Consider the following parent and child classes. Implement super() to call the parent class's method and override it in the child class.

```
class Shape:
    def area(self):
        pass

class Circle(Shape):
    def __init__(self, radius):
        self.radius = radius
```

```
    def area(self):
        # Call parent class's area method
        pass
```

Fill in the code to calculate the area of the circle and demonstrate the use of super().