Practical 4

4.1

Aim: Class, Objects and Inheritance:

- Create a class with attributes and methods.
- Instantiate an object from a class.
- Access and modify the attributes of an object.
- Call methods defined in a class using an object.
- Access and modify the attributes of an object using getter and setter methods.
- Create a subclass that inherits from a superclass.
- Override methods in a subclass to provide specific implementations.
- Call methods from the superclass using the super() function.
- Define and use class variables that are shared among all instances of a class.
- Define and use instance variables that are unique to each object.
- Create a class that inherit from multiple superclass
- Understand and use the method resolution order to determine the order in which base classes are searched.

Code:

```
# Class, Objects, and Inheritance Example

# 1. Create a class with attributes and methods
class Animal:
    # Class variable shared among all instances
    species = "Animal"

    def __init__(self, name, age):
        # Instance variables unique to each object
        self.name = name
        self.age = age

    # Method
    def make_sound(self):
        return "Some generic sound"

    # Getter method
    def get_name(self):
        return self.name

    # Setter method
    def set_name(self, name):
        self.name = name

# 2. Instantiate an object from a class
animal = Animal("Buddy", 5)

# 3. Access and modify the attributes of an object
print(f"Initial name: {animal.name}")
```

```python
animal.name = "Max"
print(f"Modified name: {animal.name}")

# 4. Call methods defined in a class using an object
print(animal.make_sound())

# 5. Access and modify the attributes of an object using getter and
setter methods
print(f"Name using getter: {animal.get_name()}")
animal.set_name("Charlie")
print(f"Name after setter: {animal.get_name()}")

# 6. Create a subclass that inherits from a superclass
class Dog(Animal):
    def __init__(self, name, age, breed):
        # Call the superclass's __init__ method
        super().__init__(name, age)
        self.breed = breed

    # 7. Override methods in a subclass to provide specific
implementations
    def make_sound(self):
        return "Woof!"

# 8. Call methods from the superclass using the super() function
    def get_species(self):
        return super().species

# 9. Define and use class variables that are shared among all instances
of a class
print(f"Animal species: {Animal.species}")

# 10. Define and use instance variables that are unique to each object
dog = Dog("Rex", 3, "Golden Retriever")
print(f"Dog name: {dog.name}, age: {dog.age}, breed: {dog.breed}")
print(dog.make_sound())
print(f"Dog species: {dog.get_species()}")

# 11. Create a class that inherits from multiple superclasses
class Bird:
    def __init__(self, can_fly):
        self.can_fly = can_fly

    def make_sound(self):
        return "Chirp!"
```

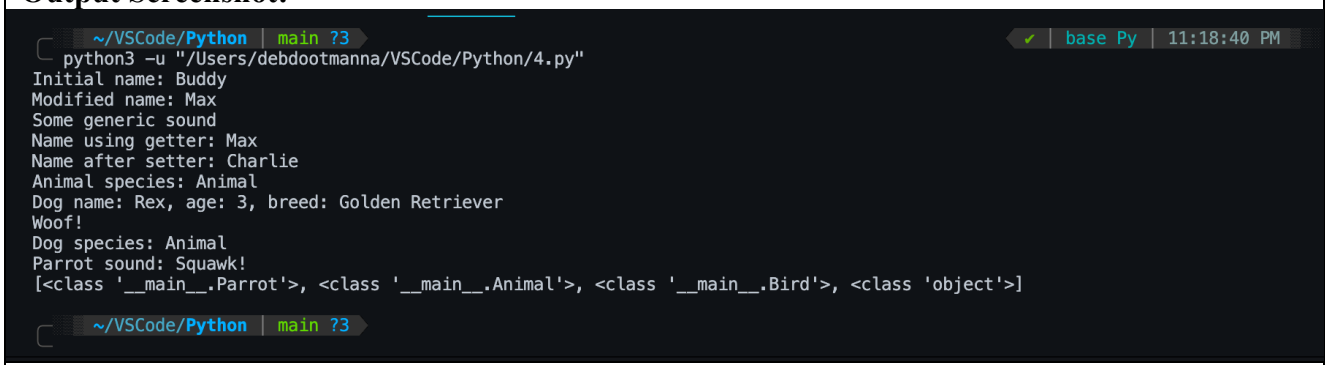
```python
class Parrot(Animal, Bird):
    def __init__(self, name, age, can_fly):
        Animal.__init__(self, name, age)
        Bird.__init__(self, can_fly)

    # Override method
    def make_sound(self):
        return "Squawk!"

# 12. Understand and use the method resolution order to determine the
order in which base classes are searched
parrot = Parrot("Polly", 2, True)
print(f"Parrot sound: {parrot.make_sound()}")

# Check Method Resolution Order (MRO)
print(Parrot.mro())
```

Output Screenshot:



Conclusion/Summary:

This practical exercise demonstrated essential object-oriented programming (OOP) concepts in Python, including classes, objects, inheritance, method overriding, getters/setters, class and instance variables, multiple inheritance, and method resolution order (MRO). By creating classes like `Animal`, `Dog`, `Bird`, and `Parrot`, we learned how to:

1. Define classes, instantiate objects, and manipulate attributes.
2. Use getters/setters for encapsulation.
3. Implement inheritance and override methods in subclasses.
4. Use `super()` to call superclass methods.
5. Differentiate between class and instance variables.
6. Handle multiple inheritance and understand MRO.

These concepts are fundamental for writing reusable, maintainable, and scalable code. This practical provides a solid foundation for applying OOP principles in real-world Python projects.

Student Signature & Date	Marks:	Evaluator Signature & Date