Terna Engineering College
Computer Engineering Department
Program: Sem VIII

Course: Distributed Computing Lab (CSL802)

Faculty: Rohini Patil

Experiment No. 3

A.1 Aim: To Implement any application using RMI/RPC.

PART B
(PART B: TO BE COMPLETED BY STUDENTS)

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Class: BE COMPS B 50	**Batch:** B3
Date of Experiment: 27-01-2022	**Date of Submission:** 27-01-2022
Grade:	

B.1 Software Code written by student:

- **Server.py**

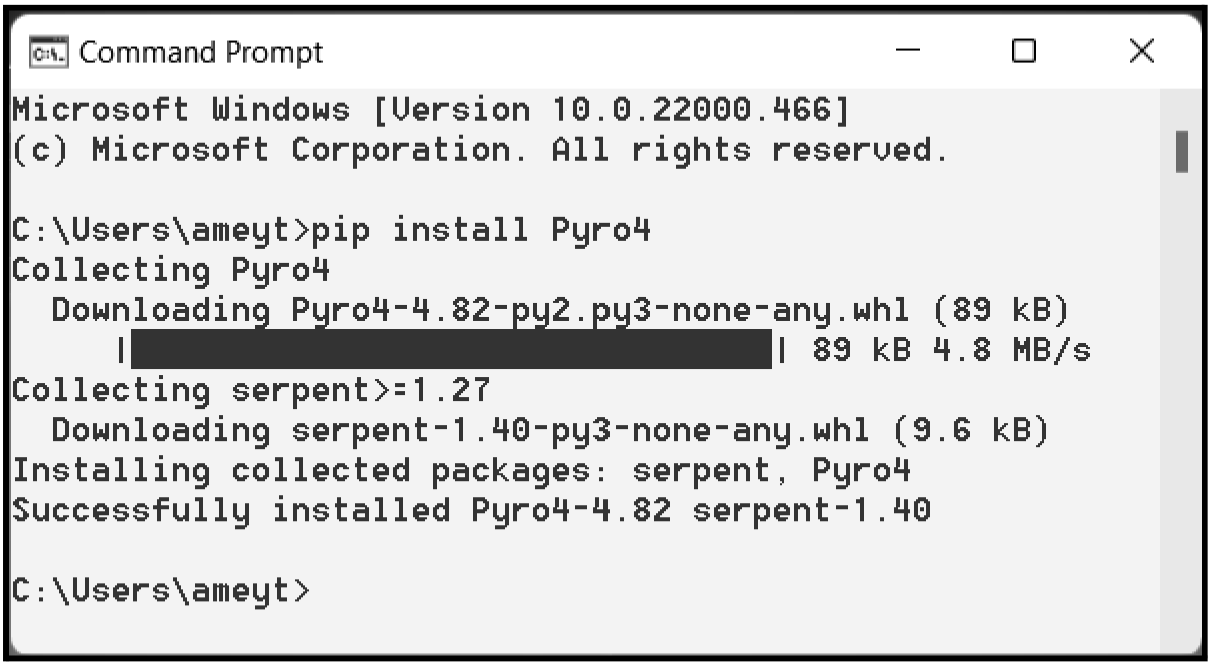
```
import Pyro4
import random
import os
import datetime
import subprocess
import math

now=datetime.datetime.now()
print('date: '+now.strftime('%d-%m-%y')+' Time:'+now.strftime('%H:%M:%S'))
@Pyro4.expose

class Server(object):
    def get_usid(self, name):
        return "Hello, {0}.\n" \
        "Your Current User Session is {1}:".format(name, random.randint(0,1000))
    def add(self, a, b):
        return "{0} + {1} = {2}".format(a, b, a+b)

    def subtract(self, a, b):
        return "{0} - {1} = {2}".format(a, b, a-b)

    def multiply(self, a, b):
        return "{0} * {1} = {2}".format(a, b, a*b)

    def division(self, a, b):
        return "{0} / {1} = {2}".format(a, b, a/b)

    def sqr(self, a):
        return "{0} ^ 2 = {1}".format(a, a**2)

    def sqrt(self, a):
        return "sqrt({0}) = {1}".format(a, math.sqrt(a))

    def mod(self, a, b):
        return "{0} % {1} = {2}".format(a, b, a%b)

    def per(self, a, b):
        return "( {0} / {1} ) * 100 = {2}".format(a, b, (a/b)*100)

    def exp(self, a, b):
        return "{0} ** {1} = {2}".format(a, b, a**b)

daemon = Pyro4.Daemon()
ns = Pyro4.locateNS()
url = daemon.register(Server)
ns.register("RMI.calculator", url)

print("The Server is now active., please request your calculations or start file transfer")

daemon.requestLoop()
```

- **Client.py**

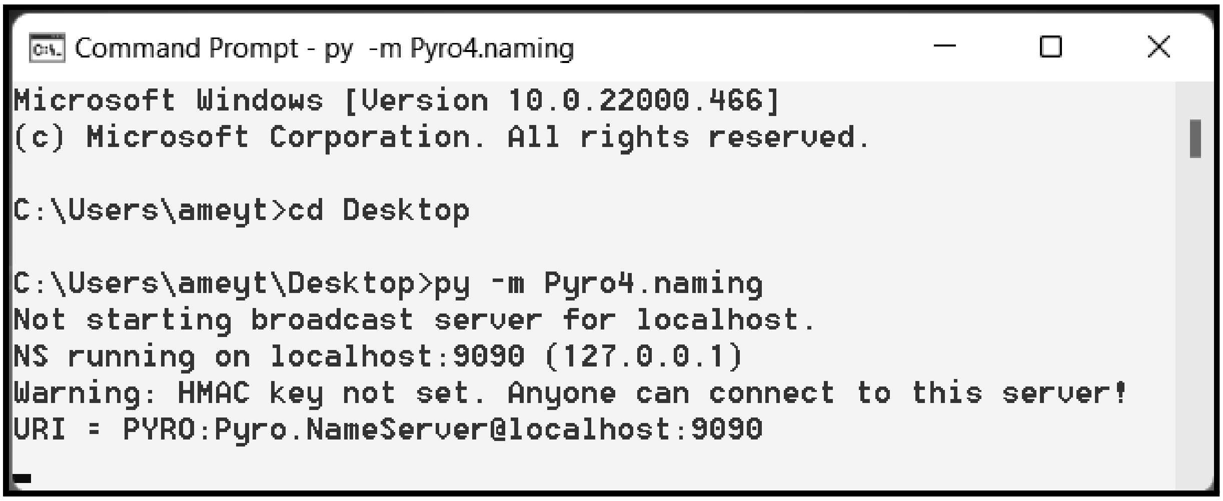
```
import Pyro4
import os
import datetime

Client = Pyro4.Proxy("PYRONAME:RMI.calculator")
name =input("What is your name? ").strip()
```

```
now=datetime.datetime.now()

print('date: '+now.strftime('%d-%m-%y')+' Time:'+now.strftime('%H:%M:%S'))
print(Client.get_usid(name))
print("Enter the number of calculations to be done")
n=int(input("Enter n: "))

while (n>0):
    n=n-1
    print()
    a =int(input("Enter a: "))
    b =int(input("Enter b: "))

     print("Enter number for desired calculations: \n" +'1.ADD \n'+'2.SUBTRACT \n'+
'3.MULTIPLY \n'+ '4.DIVISION \n'+'5.SQUARE \n'+'6.SQRT \n'+ '7.MOD \n'+
'8.PERCENTAGE \n'+'9.EXPONENTIATION')

    c=int(input('Enter your choice: '))

    if (c==1):
        print(Client.add(a,b))
    elif (c==2):
        print(Client.subtract(a,b))
    elif (c==3):
        print(Client.multiply(a,b))
    elif (c==4):
        print(Client.division(a,b))
    elif (c==5):
        print(Client.sqr(a))
    elif (c==6):
        print(Client.sqrt(a))
    elif (c==7):
        print(Client.mod(a, b))
    elif (c==8):
        print(Client.per(a, b))
    elif (c==9):
        print(Client.exp(a, b))
    else:
        print('invalid input')
```

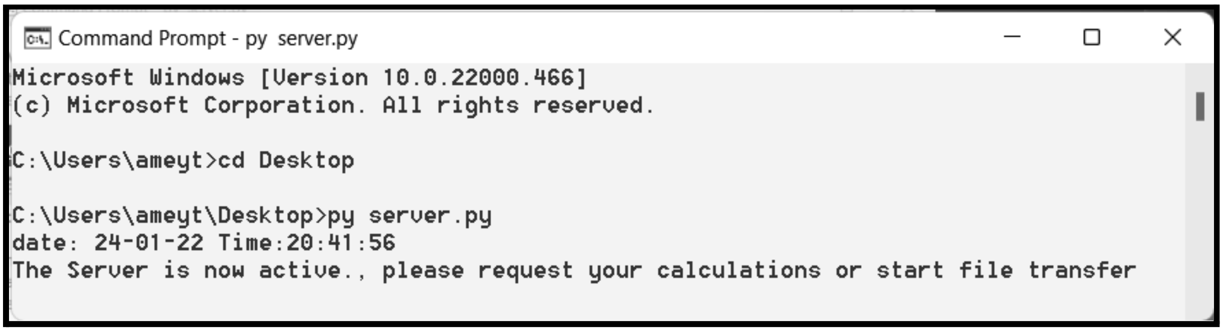
B.2 Input and Output:



```
Microsoft Windows [Version 10.0.22000.466]
(c) Microsoft Corporation. All rights reserved.

C:\Users\ameyt>pip install Pyro4
Collecting Pyro4
  Downloading Pyro4-4.82-py2.py3-none-any.whl (89 kB)
     |████████████████████████████████| 89 kB 4.8 MB/s
Collecting serpent>=1.27
  Downloading serpent-1.40-py3-none-any.whl (9.6 kB)
Installing collected packages: serpent, Pyro4
Successfully installed Pyro4-4.82 serpent-1.40

C:\Users\ameyt>
```

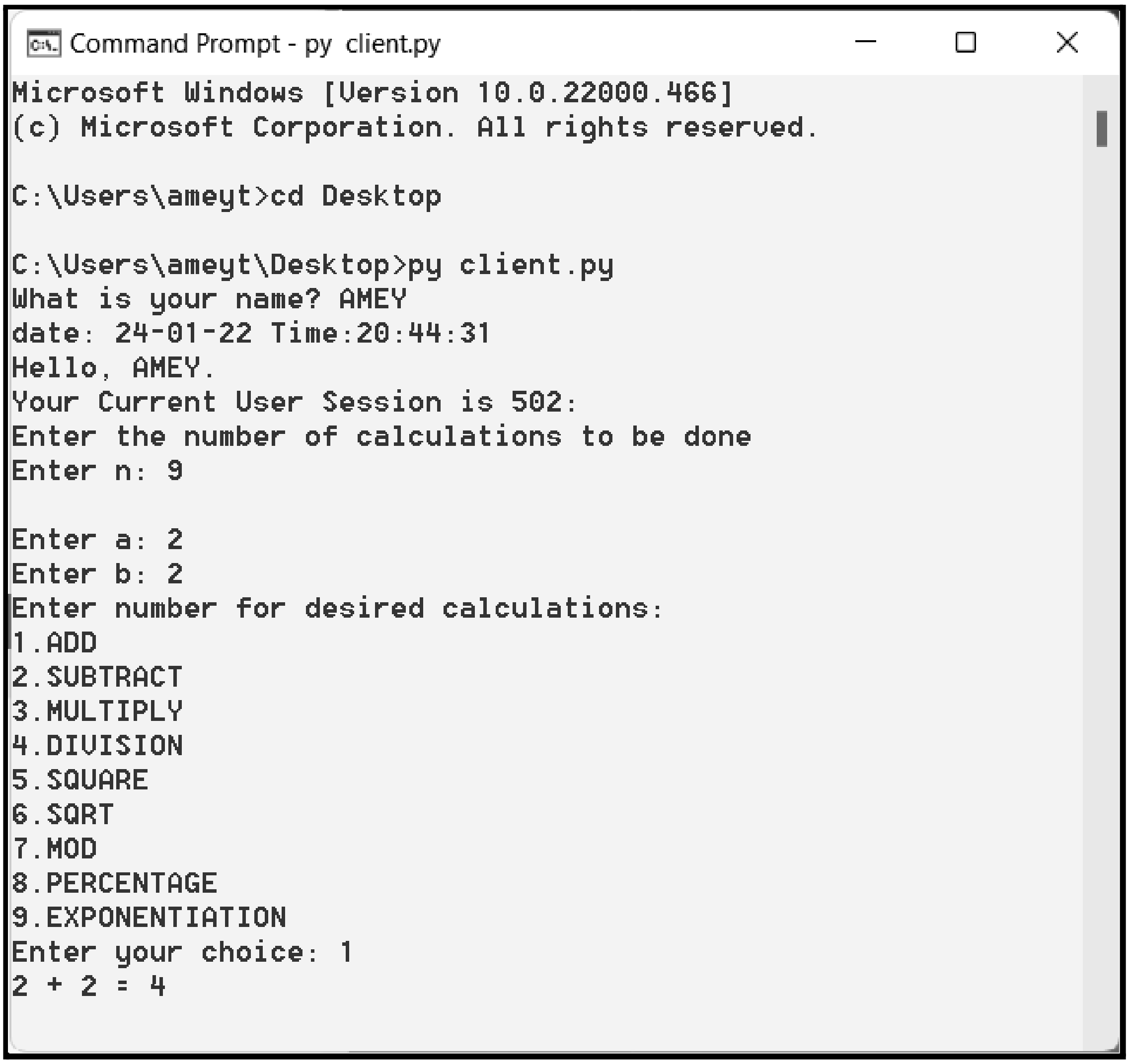


```
Microsoft Windows [Version 10.0.22000.466]
(c) Microsoft Corporation. All rights reserved.

C:\Users\ameyt>cd Desktop

C:\Users\ameyt\Desktop>py -m Pyro4.naming
Not starting broadcast server for localhost.
NS running on localhost:9090 (127.0.0.1)
Warning: HMAC key not set. Anyone can connect to this server!
URI = PYRO:Pyro.NameServer@localhost:9090
```



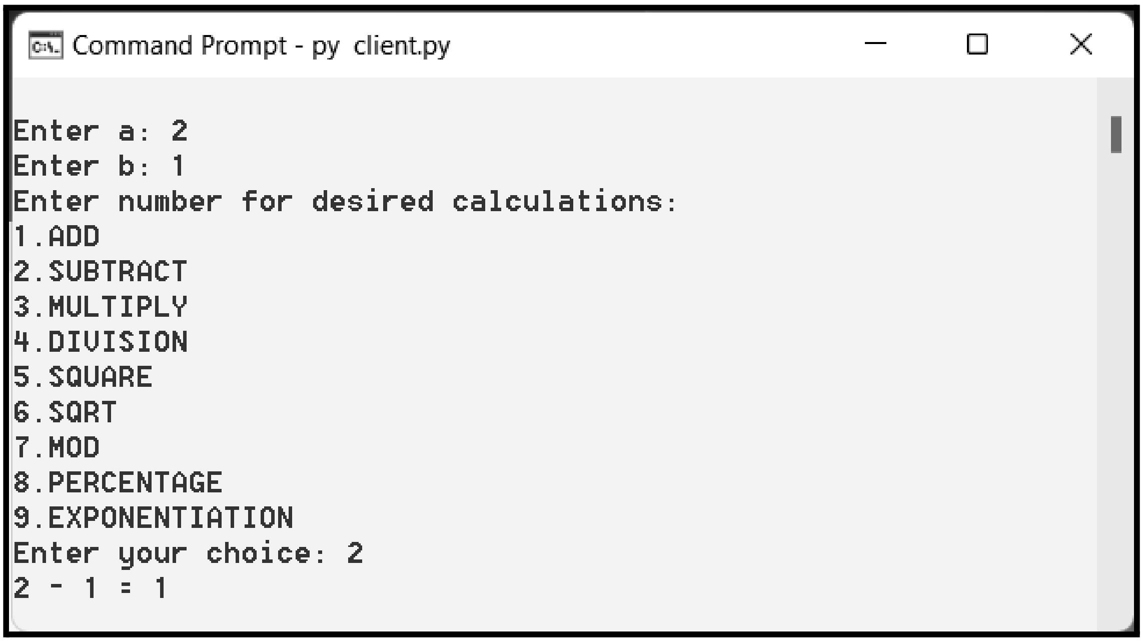
```
Microsoft Windows [Version 10.0.22000.466]
(c) Microsoft Corporation. All rights reserved.

C:\Users\ameyt>cd Desktop

C:\Users\ameyt\Desktop>py server.py
date: 24-01-22 Time:20:41:56
The Server is now active., please request your calculations or start file transfer
```

1. ADDITION



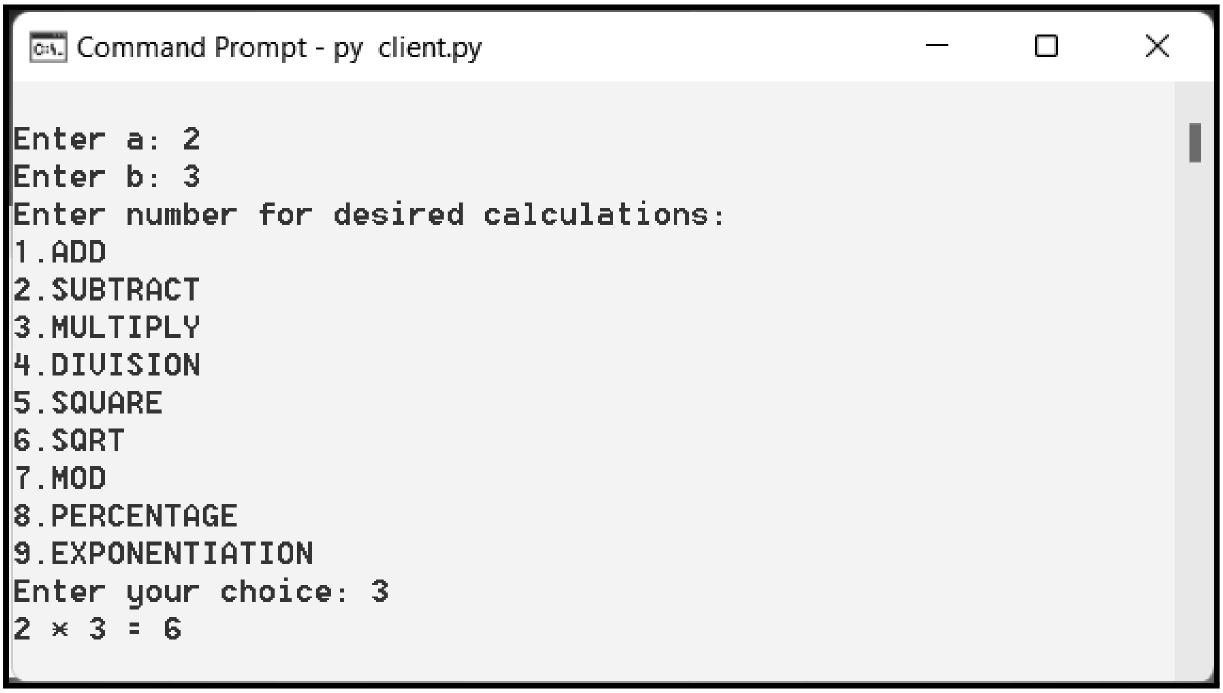
```
Microsoft Windows [Version 10.0.22000.466]
(c) Microsoft Corporation. All rights reserved.

C:\Users\ameyt>cd Desktop

C:\Users\ameyt\Desktop>py client.py
What is your name? AMEY
date: 24-01-22 Time:20:44:31
Hello, AMEY.
Your Current User Session is 502:
Enter the number of calculations to be done
Enter n: 9

Enter a: 2
Enter b: 2
Enter number for desired calculations:
1.ADD
2.SUBTRACT
3.MULTIPLY
4.DIVISION
5.SQUARE
6.SQRT
7.MOD
8.PERCENTAGE
9.EXPONENTIATION
Enter your choice: 1
2 + 2 = 4
```

2. SUBTRACTION



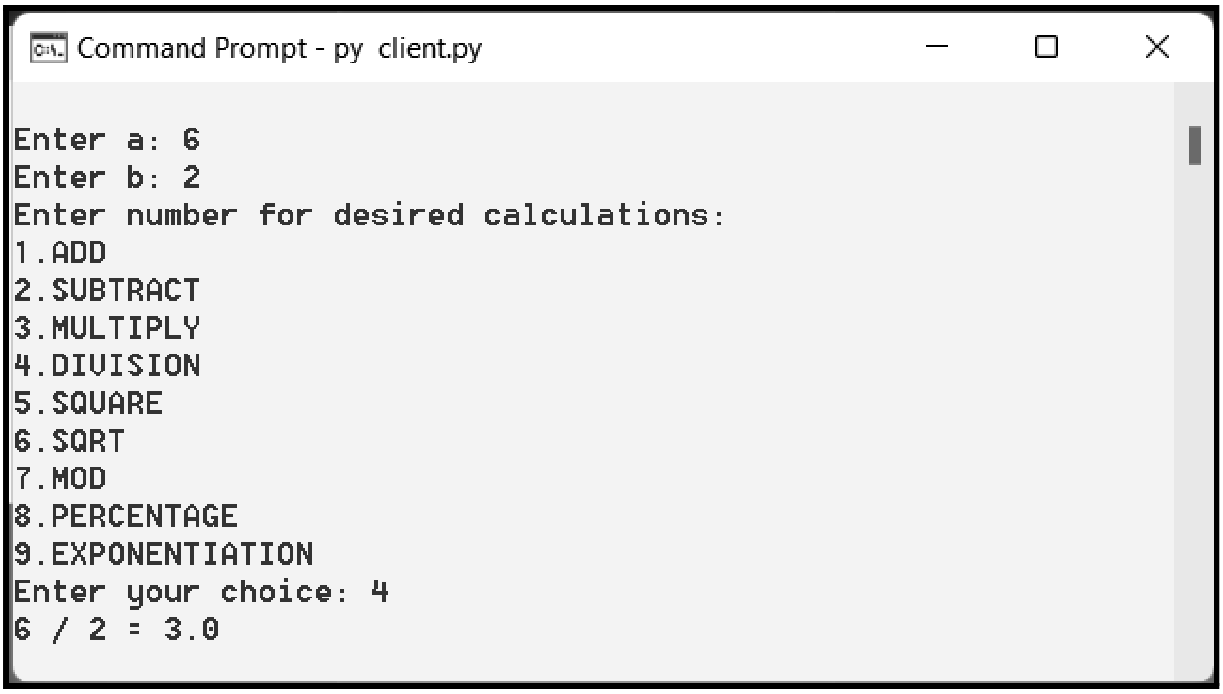
```
Enter a: 2
Enter b: 1
Enter number for desired calculations:
1.ADD
2.SUBTRACT
3.MULTIPLY
4.DIVISION
5.SQUARE
6.SQRT
7.MOD
8.PERCENTAGE
9.EXPONENTIATION
Enter your choice: 2
2 - 1 = 1
```

3. MULTIPLICATION



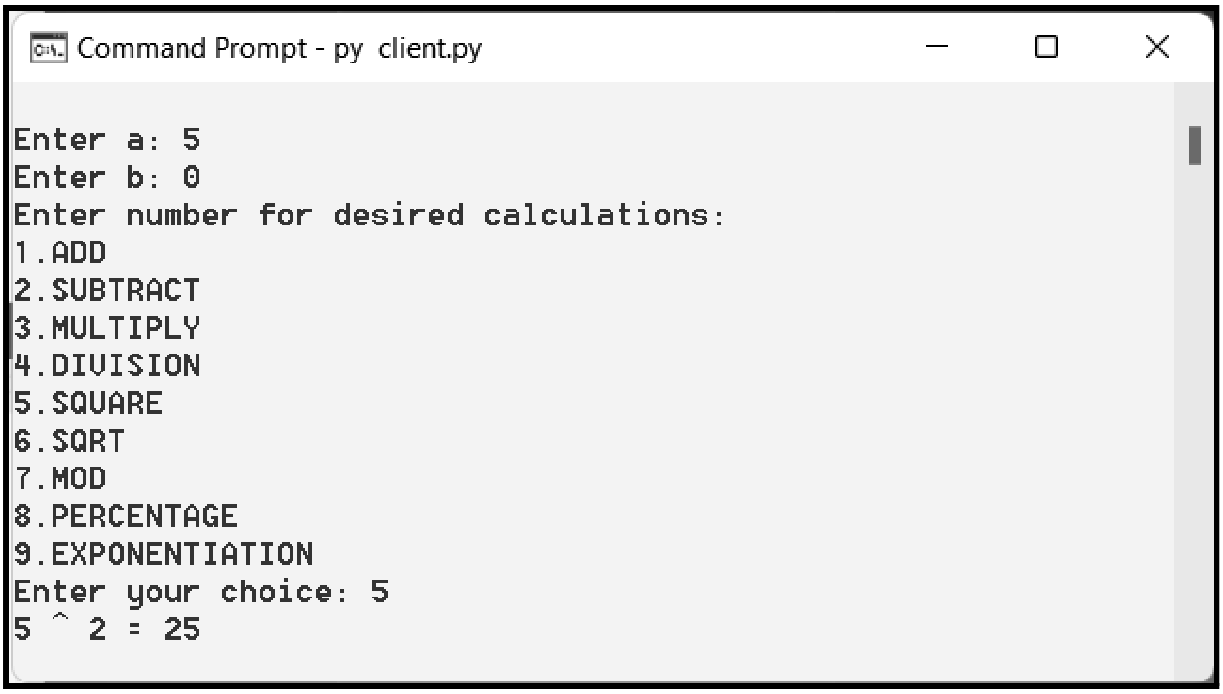
```
Enter a: 2
Enter b: 3
Enter number for desired calculations:
1.ADD
2.SUBTRACT
3.MULTIPLY
4.DIVISION
5.SQUARE
6.SQRT
7.MOD
8.PERCENTAGE
9.EXPONENTIATION
Enter your choice: 3
2 × 3 = 6
```

4. DIVISION



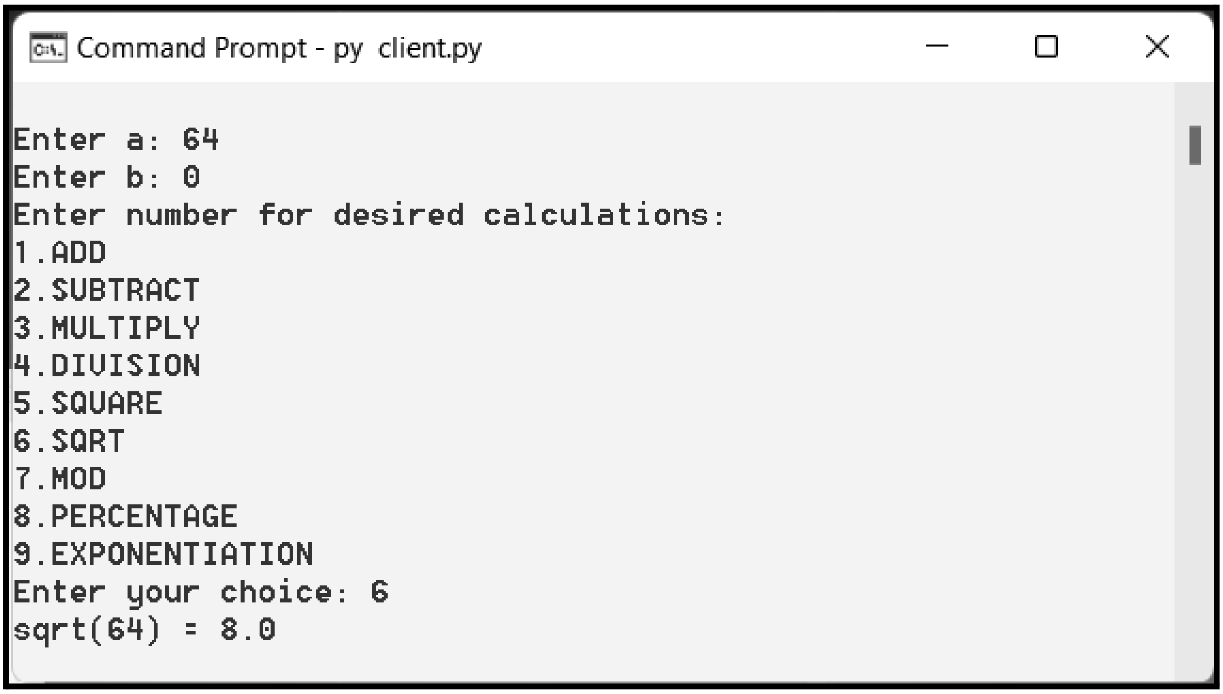
```
Enter a: 6
Enter b: 2
Enter number for desired calculations:
1.ADD
2.SUBTRACT
3.MULTIPLY
4.DIVISION
5.SQUARE
6.SQRT
7.MOD
8.PERCENTAGE
9.EXPONENTIATION
Enter your choice: 4
6 / 2 = 3.0
```

5. **SQUARE**



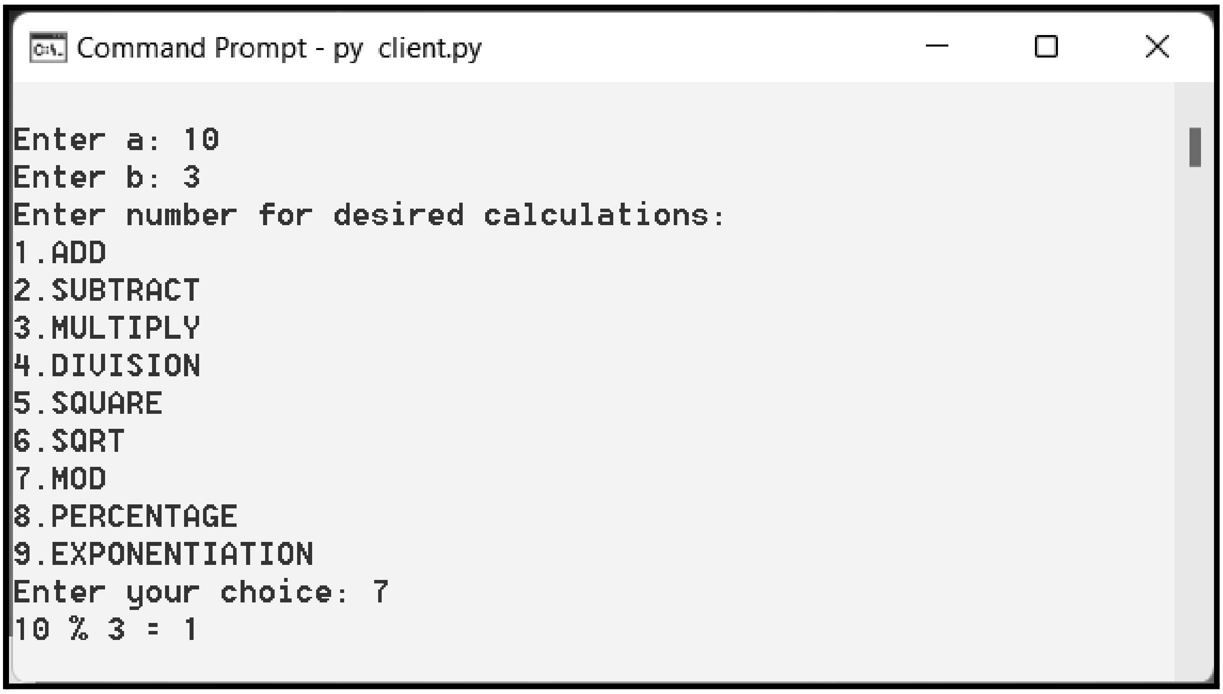
```
Enter a: 5
Enter b: 0
Enter number for desired calculations:
1.ADD
2.SUBTRACT
3.MULTIPLY
4.DIVISION
5.SQUARE
6.SQRT
7.MOD
8.PERCENTAGE
9.EXPONENTIATION
Enter your choice: 5
5 ^ 2 = 25
```

6. **SQRT**



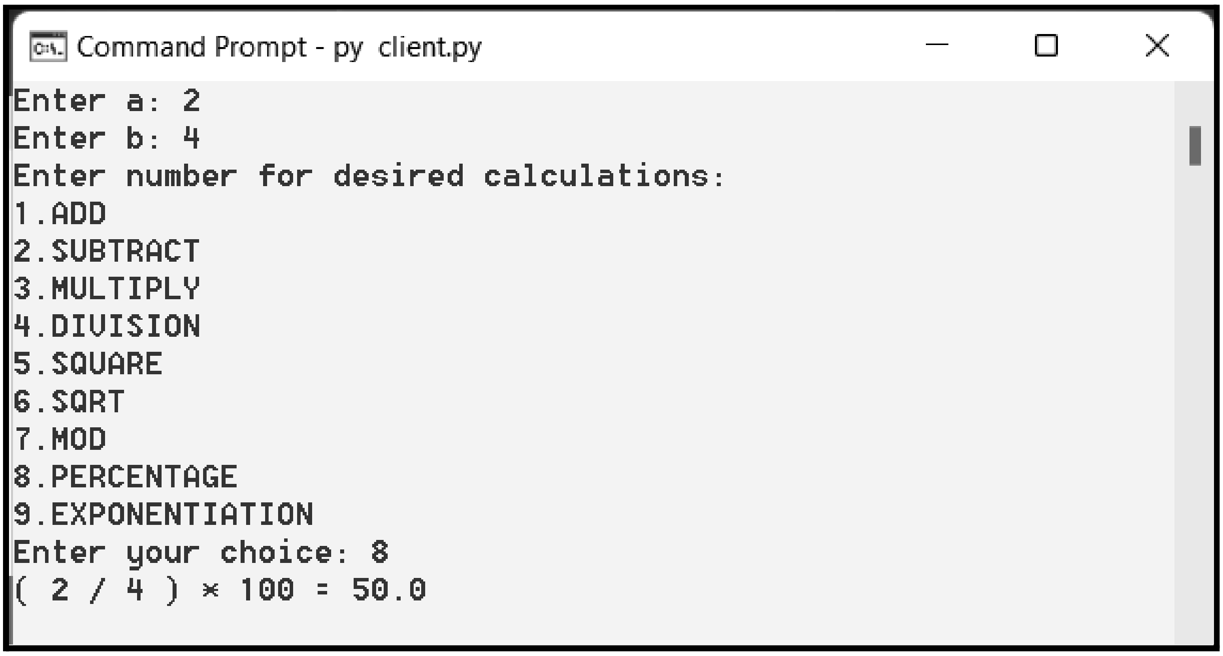
```
Enter a: 64
Enter b: 0
Enter number for desired calculations:
1.ADD
2.SUBTRACT
3.MULTIPLY
4.DIVISION
5.SQUARE
6.SQRT
7.MOD
8.PERCENTAGE
9.EXPONENTIATION
Enter your choice: 6
sqrt(64) = 8.0
```

7. MOD



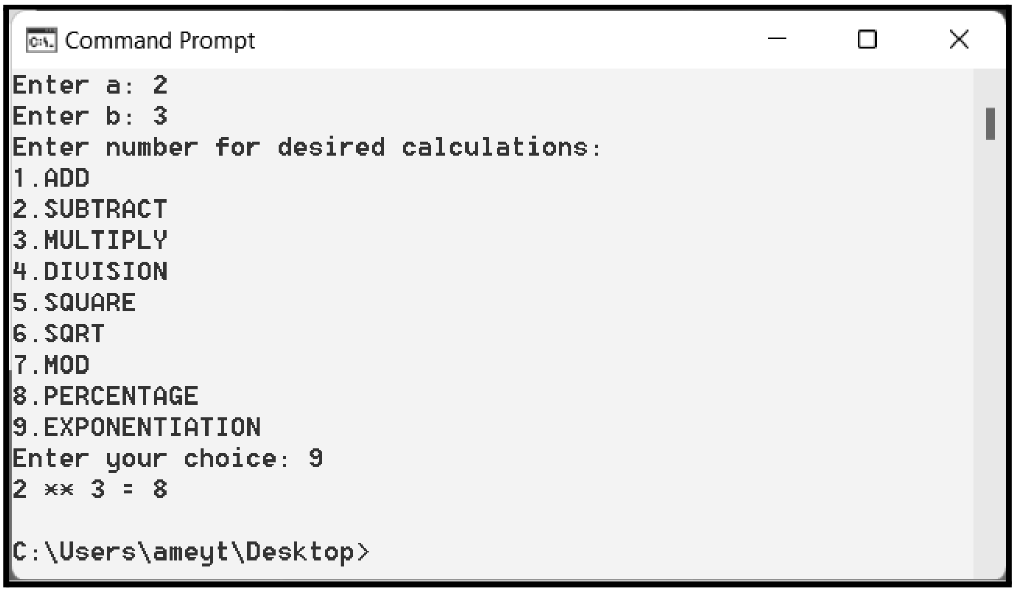
```
Enter a: 10
Enter b: 3
Enter number for desired calculations:
1.ADD
2.SUBTRACT
3.MULTIPLY
4.DIVISION
5.SQUARE
6.SQRT
7.MOD
8.PERCENTAGE
9.EXPONENTIATION
Enter your choice: 7
10 % 3 = 1
```

8. PERCENTAGE



```
Enter a: 2
Enter b: 4
Enter number for desired calculations:
1.ADD
2.SUBTRACT
3.MULTIPLY
4.DIVISION
5.SQUARE
6.SQRT
7.MOD
8.PERCENTAGE
9.EXPONENTIATION
Enter your choice: 8
( 2 / 4 ) * 100 = 50.0
```

9. **EXPONENTIATION**



```
Enter a: 2
Enter b: 3
Enter number for desired calculations:
1.ADD
2.SUBTRACT
3.MULTIPLY
4.DIVISION
5.SQUARE
6.SQRT
7.MOD
8.PERCENTAGE
9.EXPONENTIATION
Enter your choice: 9
2 ** 3 = 8

C:\Users\ameyt\Desktop>
```

B.3 Observations and learning:

In a distributed computing environment, remote method invocation (RMI) refers to calling a method on a remote object. It is analogous to a remote procedure call.

B.4 Conclusion:

Successfully implemented a calculator application using RMI.

B.5 Question of Curiosity.

Q1: What do you mean by stub? What are the functions of Stub?

ANS:

- A method stub or simply stub in software development is a piece of code used to stand in for some other programming functionality. A stub may simulate the behaviour of existing code (such as a procedure on a remote machine; such methods are often called mocks) or be a temporary substitute for yet-to-be-developed code.

Q2: What is marshalling and unmarshalling?

ANS:

- Marshalling is the process of transforming the memory representation of an object into another format, which is suitable for storage or transmission to other software applications.
- Unmarshalling is the process in which an object or data structure is deserialized.

Q3: How is the stub generated?

ANS:

- Stubs are generated either manually or automatically. In a manual generation, a remote procedure call implementer provides translation functions, from which a user constructs stubs. They handle complex parameter types. Automatic stub generation is commonly used to generate stubs. They use integration description language to define client and server interfaces.