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BCSE308P-COMPUTER NETWORKS LAB

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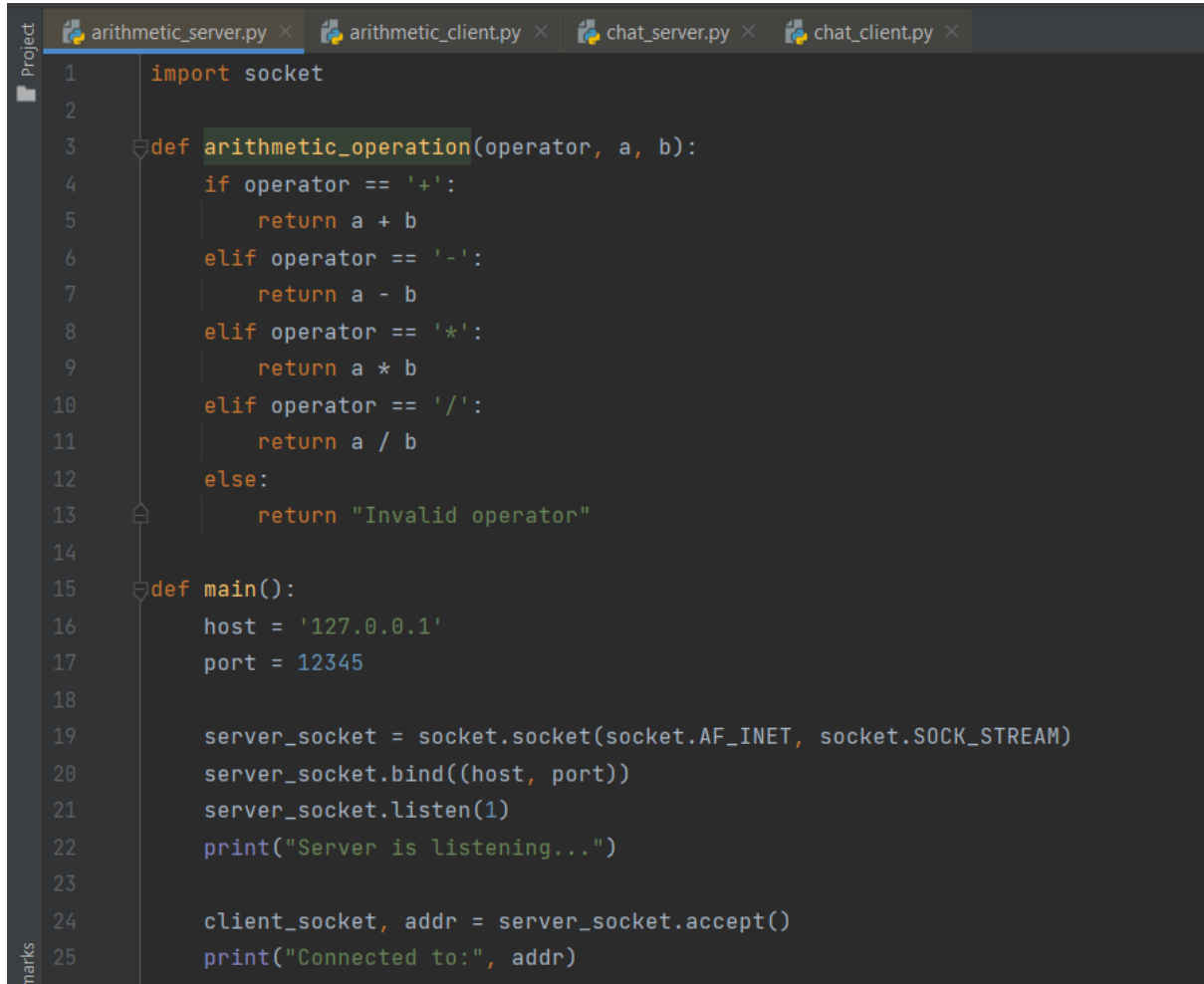
REG.NO : 22BAI1308

SEM : FALL 23-24

**TOPIC : EXPERIMENT- 3&4
(SOCKET PROGRAMMING)**

- Single client-Single server with arithmetic operations.

Server (arithmetic_server.py):



```
1  import socket
2
3  def arithmetic_operation(operator, a, b):
4      if operator == '+':
5          return a + b
6      elif operator == '-':
7          return a - b
8      elif operator == '*':
9          return a * b
10     elif operator == '/':
11         return a / b
12     else:
13         return "Invalid operator"
14
15 def main():
16     host = '127.0.0.1'
17     port = 12345
18
19     server_socket = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
20     server_socket.bind((host, port))
21     server_socket.listen(1)
22     print("Server is listening...")
23
24     client_socket, addr = server_socket.accept()
25     print("Connected to:", addr)
```

```

26
27     while True:
28         data = client_socket.recv(1024).decode()
29         if not data:
30             break
31
32         operator, a, b = data.split(',')
33         result = arithmetic_operation(operator, float(a), float(b))
34         client_socket.send(str(result).encode())
35
36     client_socket.close()
37
38 if __name__ == "__main__":
39     main()
40

```

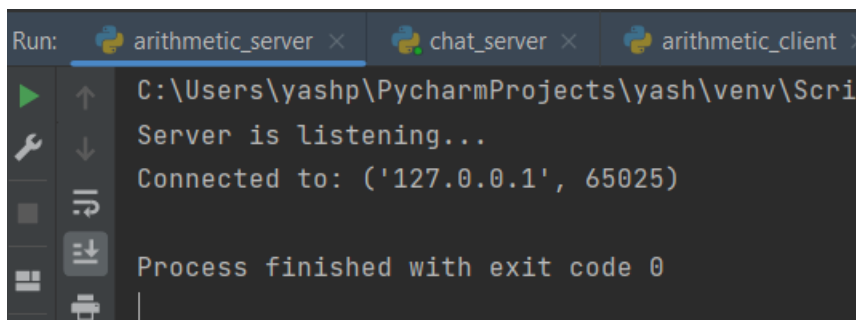
Client (arithmetic_client.py):

```

Project
arithmetic_server.py x arithmetic_client.py x chat_server.py x chat_client.py x
1     import socket
2
3     def main():
4         host = '127.0.0.1'
5         port = 12345
6
7         client_socket = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
8         client_socket.connect((host, port))
9
10        operator = input("Enter operator (+, -, *, /): ")
11        a = input("Enter first number: ")
12        b = input("Enter second number: ")
13
14        data = f"{operator},{a},{b}"
15        client_socket.send(data.encode())
16
17        result = client_socket.recv(1024).decode()
18        print("Result:", result)
19
20        client_socket.close()
21
22 if __name__ == "__main__":
23     main()
24

```

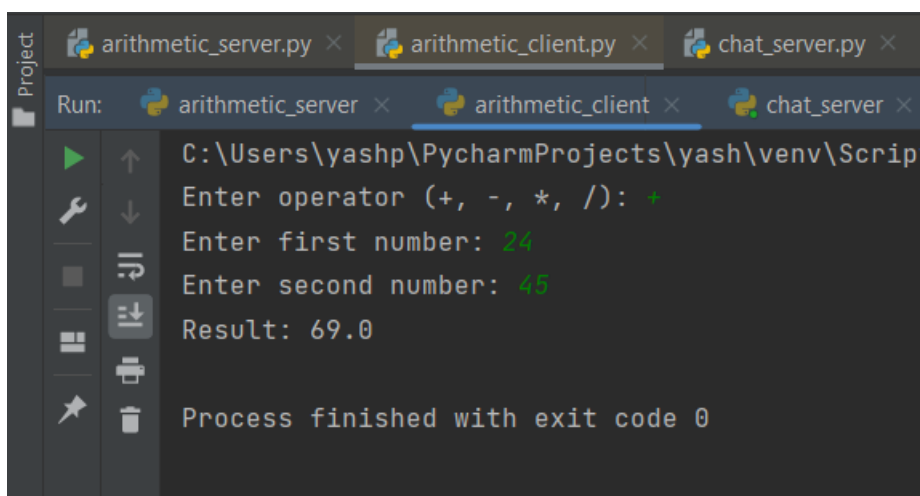
SERVER INPUT :



The image shows a PyCharm Run console window with three tabs: arithmetic_server, chat_server, and arithmetic_client. The arithmetic_server tab is active. The console output shows the server listening, a connection from 127.0.0.1 on port 65025, and the process finishing with exit code 0.

```
Run: arithmetic_server x chat_server x arithmetic_client x
C:\Users\yashp\PycharmProjects\yash\venv\Scripts>
Server is listening...
Connected to: ('127.0.0.1', 65025)
Process finished with exit code 0
```

CLIENT OUTPUT :



The image shows a PyCharm Run console window with three tabs: arithmetic_server.py, arithmetic_client.py, and chat_server.py. The arithmetic_client.py tab is active. The console output shows the client entering an operator (+), two numbers (24 and 45), and the resulting output (69.0), followed by the process finishing with exit code 0.

```
Project arithmetic_server.py x arithmetic_client.py x chat_server.py x
Run: arithmetic_server x arithmetic_client x chat_server x
C:\Users\yashp\PycharmProjects\yash\venv\Scripts>
Enter operator (+, -, *, /): +
Enter first number: 24
Enter second number: 45
Result: 69.0
Process finished with exit code 0
```

1. TCP Chat Application

Server (chat_server.py):

Client (chat_client.py):

```
chat_server.py x chat_client.py x
1 import socket
2
3 def main():
4     host = '127.0.0.1'
5     port = 12346
6
7     client_socket = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
8     client_socket.connect((host, port))
9
10    while True:
11        message = input("You: ")
12        client_socket.send(message.encode())
13        if message.lower() == 'bye':
14            break
15
16        response = client_socket.recv(1024).decode()
17        print("Server:", response)
18
19    client_socket.close()
20
21 if __name__ == "__main__":
22     main()
```

CLIENT SIDE OUTPUT :

```
Run: chat_server x chat_client x
C:\Users\yashp\PycharmProjects\yash\venv\Scripts\python.exe C:\User
You: Hi I am Swapnil 22BAI1308
Server: [2023-08-27 21:40:25] Hi I am Swapnil 22BAI1308
You: I completed my dinner
Server: [2023-08-27 21:40:57] I completed my dinner
You: |
```

SERVER SIDE OUTPUT :

```
Run: chat_server x chat_client x
C:\Users\yashp\PycharmProjects\yash\venv\Scripts\python.exe
Server is listening...
Connected to: ('127.0.0.1', 65026)
[2023-08-27 21:40:25] Hi I am Swapnil 22BAI1308
[2023-08-27 21:40:57] I completed my dinner
|
```

2. UDP – OTP Checking

Server (udp_server.py):

```
1 import socket
2 import random
3
4
5 def generate_otp():
6     return str(random.randint(1000, 9999))
7
8
9 def authenticate_user(userid, password, otp_received):
10     # In a real application, you'd validate against a user database.
11     # Here, we're using some hardcoded values for demonstration.
12     valid_users = {
13         'user1': {'password': 'pass123', 'otp': generate_otp()},
14         'user2': {'password': 'hello456', 'otp': generate_otp()}
15     }
16
17     if userid in valid_users:
18         user_data = valid_users[userid]
19         if user_data['password'] == password and user_data['otp'] == otp_received:
20             return True
21     return False
```

```
22
23
24 def main():
25     server_ip = '0.0.0.0'
26     server_port = 12345
27
28     server_socket = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
29     server_socket.bind((server_ip, server_port))
30
31     print("UDP server is listening...")
32
33     while True:
34         data, client_address = server_socket.recvfrom(1024)
35         data = data.decode('utf-8')
36         userid, password, otp_r
37
38         if authenticate_user(userid, password, otp_received):
39             response = "Authentication successful"
40         else:
41             response = "Authentication failed"
42
43         server_socket.sendto(response.encode('utf-8'), client_address)
44
45
46 if __name__ == "__main__":
47     main()
48
```

Client(udp_clients.py):


```
Project
udp_server.py × udp_clients.py ×
1 import socket
2
3
4 def main():
5     server_ip = '127.0.0.1'
6     server_port = 12345
7     client_socket = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
8
9     userid = input("Enter your userid: ")
10    password = input("Enter your password: ")
11
12    client_socket.sendto(f"{userid},{password}".encode('utf-8'), (server_ip, server_port))
13
14    otp_received = input("Enter the OTP received on your device: ")
15    client_socket.sendto(otp_received.encode('utf-8'), (server_ip, server_port))
16
17    response, _ = client_socket.recvfrom(1024)
18    print(response.decode('utf-8'))
19
20
21 if __name__ == "__main__":
22     main()
23
```

OUTPUT (in TERMINALS):

```
Windows PowerShell
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Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\My Files\Save Files of apps\Python\Socket Programming\Q4> python server.py
Server is listening for connections...
('127.0.0.1', 14056) authenticated as user1
('127.0.0.1', 14061) disconnected

Windows PowerShell
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PS C:\My Files\Save Files of apps\Python\Socket Programming\Q4> python client.py
User ID: user1
Password: password1
Solve the captcha: Solve the captcha: 2 + 9
Captcha answer: 11
Authentication successful. You can start chatting.
You can start chatting. Type 'exit' to leave.

Windows PowerShell
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PS C:\My Files\Save Files of apps\Python\Socket Programming\Q4> python client.py
User ID: user2
Password: password2
Solve the captcha: Solve the captcha: 4 / 9
Captcha answer: 0.44444444
Authentication failed. Connection closed.
PS C:\My Files\Save Files of apps\Python\Socket Programming\Q4> |
```

3. HTTP – Arithmetic Captcha Checking.

Server(http_server.py) :

```
http_server.py x http_client.py x
1  import socket
2      import threading
3      import random
4      from http.server import BaseHTTPRequestHandler, HTTPServer
5      from urllib.parse import parse_qs
6
7      # User database (insecure for demonstration purposes)
8      users = {"user1": "password1", "user2": "password2"}
9
10     # Generate a random arithmetic captcha
11     def generate_captcha():
12         num1 = random.randint(1, 10)
13         num2 = random.randint(1, 10)
14         operator = random.choice(["+", "-", "*"])
15         captcha = f"What is {num1} {operator} {num2}?"
16         answer = str(eval(f"{num1} {operator} {num2}"))
17         return captcha, answer
18
19     # HTTP request handler
20     class MyRequestHandler(BaseHTTPRequestHandler):
21         def do_GET(self):
22             if self.path == "/login":
23                 captcha, answer = generate_captcha()
24                 self.send_response(200)
25                 self.send_header("Content-type", "text/html")
26                 self.end_headers()
27                 self.wfile.write(f"Captcha: {captcha}".encode())
28
29                 # Store captcha answer for later verification
30                 self.captcha_answer = answer
31             else:
32                 self.send_response(404)
33                 self.end_headers()
34                 self.wfile.write(b"Page not found")
35
36         def do_POST(self):
37             if self.path == "/authenticate":
38                 content_length = int(self.headers['Content-Length'])
39                 post_data = self.rfile.read(content_length).decode("utf-8")
40                 params = parse_qs(post_data)
41                 username = params['username'][0]
42                 password = params['password'][0]
43                 captcha_response = params['captcha'][0]
44
```

```
44
45     # Check captcha and credentials
46     if captcha_response == self.captcha_answer and users.get(username) == password:
47         self.send_response(200)
48         self.send_header("Content-type", "text/html")
49         self.end_headers()
50         self.wfile.write(b"Authentication successful")
51     else:
52         self.send_response(401)
53         self.send_header("Content-type", "text/html")
54         self.end_headers()
55         self.wfile.write(b"Authentication failed")
56     else:
57         self.send_response(404)
58         self.end_headers()
59         self.wfile.write(b"Page not found")
60
61 def run_http_server():
62     server_address = ('localhost', 8080)
63     httpd = HTTPServer(server_address, MyRequestHandler)
64     print("HTTP server running on http://localhost:8080")
65     httpd.serve_forever()
66
67 # Start HTTP server in a separate thread
68 http_thread = threading.Thread(target=run_http_server)
69 http_thread.start()
70
```

Client(http_Client.py) :

```
http_server.py x http_client.py x
1 import socket
2 import requests
3
4 # Simulate a client requesting a captcha and authentication
5 def client_request():
6     captcha_response = ""
7     with requests.get("http://localhost:8080/login") as response:
8         print(response.text)
9         captcha_response = input("Enter the captcha answer: ")
10
11     username = input("Enter username: ")
12     password = input("Enter password: ")
13
14     payload = {
15         'username': username,
16         'password': password,
17         'captcha': captcha_response
18     }
19
20     response = requests.post("http://localhost:8080/authenticate", data=payload)
21     print(response.text)
22
23 # Simulate multiple clients
24 for _ in range(3):
25     client_request()
```

OUTPUT :

```
Windows PowerShell
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PS C:\My Files\Save Files of apps\Python\Socket Programming\Q3> python serve
r.py
Server is waiting for a connection...
Connected to: ('127.0.0.1', 13927)
Generated OTP for user1: 673058
PS C:\My Files\Save Files of apps\Python\Socket Programming\Q3> |

Windows PowerShell
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PS C:\My Files\Save Files of apps\Python\Socket Programming\Q3> python cli
ent.py
Connected to the server.
Enter your user ID: user1
Enter your password: password1
valid
Enter the OTP sent to your registered email/mobile: 673058
OTP verified. Access granted.
PS C:\My Files\Save Files of apps\Python\Socket Programming\Q3> |
```