Solutions to Embedded Systems and IoT Questions

Question 2: Write a program to communicate between IoT and GSM.

```
#include <SoftwareSerial.h>
#define RX 10  // Pin for RX
#define TX 11  // Pin for TX
SoftwareSerial gsm(RX, TX);  // GSM Module Communication
void setup() {
  Serial.begin(9600);       // Initialize Serial Monitor
  gsm.begin(9600);          // Initialize GSM Module
  Serial.println("Initializing GSM Communication...");
}
void loop() {
  gsm.println("AT");        // Check if GSM module responds
  delay(1000);
  if (gsm.available()) {
    Serial.write(gsm.read());
  }
}
```

Sample Output

```
Initializing GSM Communication...
OK  // GSM Module Response
```

Question 3: How to communicate between Arduino and Raspberry Pi processor using Bluetooth?

```
#include <SoftwareSerial.h>
#define BT_RX 10
```

```
#define BT_TX 11
SoftwareSerial bluetooth(BT_RX, BT_TX);
void setup() {
  Serial.begin(9600);
  bluetooth.begin(9600); // Bluetooth module communication
  Serial.println("Bluetooth Initialized. Ready to send data to Raspberry Pi.");
}
void loop() {
  bluetooth.println("Hello Raspberry Pi!");
  delay(1000);
}
```

Code for Raspberry Pi (Python)

```
import serial
bluetooth = serial.Serial('/dev/rfcomm0', 9600)
print("Waiting for data from Arduino...")
while True:
    data = bluetooth.readline().decode('utf-8').strip()
    print(f"Received: {data}")
```

Sample Output (on Raspberry Pi)

```
Waiting for data from Arduino...
Received: Hello Raspberry Pi!
```

Question 4: Write a program to transfer the data between two registers.

Code (Assembly for 8051 Microcontroller)

```
MOV A, #0x05   ; Load 5 into Register A
MOV R0, A      ; Transfer data from Register A to R0
MOV R1, R0     ; Transfer data from R0 to R1
```

```

#### Explanation

- **MOV A, #0x05**: Load immediate value 5 into the accumulator.

- **MOV R0, A**: Copy value from the accumulator to Register R0.

- **MOV R1, R0**: Transfer data from Register R0 to R1.

## Question 6: How to communicate between Arduino and Raspberry Pi processor using GSM?

```
#include <SoftwareSerial.h>
#define RX 10
#define TX 11
SoftwareSerial gsm(RX, TX);
void setup() {
  Serial.begin(9600);
  gsm.begin(9600);
  Serial.println("Initializing GSM Communication...");
  gsm.println("AT"); // Send basic command to GSM module
}
void loop() {
  gsm.println("AT+CMGF=1"); // Set SMS text mode
  delay(1000);
  gsm.println("AT+CMGS=\"+1234567890\""); // Send SMS
  delay(1000);
  gsm.println("Hello from Arduino to Raspberry Pi.");
  gsm.write(26); // End of message
  delay(5000);
}
```

**Sample Output**

Message sent to Raspberry Pi via GSM: Hello from Arduino to Raspberry Pi.
```

Question 10: Write a program to communicate between IoT and Bluetooth.

```
#include <SoftwareSerial.h>
#define BT_RX 10
#define BT_TX 11
SoftwareSerial bluetooth(BT_RX, BT_TX);
void setup() {
  Serial.begin(9600);
  bluetooth.begin(9600);
  Serial.println("Bluetooth Communication Initialized.");
}
void loop() {
  bluetooth.println("IoT Data via Bluetooth");
  delay(2000);
}
```

Sample Output

Bluetooth Communication Initialized.

IoT Data via Bluetooth

Question 11: Write a program to find the largest number in the group using a simulator tool.

```
#include <stdio.h>
int main() {
    int numbers[] = {10, 25, 47, 2, 30};
    int max = numbers[0];
    for (int i = 1; i < 5; i++) {
        if (numbers[i] > max) {
            max = numbers[i];
```

```
        }
    }
    printf("The largest number is: %d\n", max);
    return 0;
}
```

Sample Output

The largest number is: 47

Question 13: Write an assembly language program to compare the numbers using a simulator.

Code (Assembly for 8051 Microcontroller)

```
MOV A, #0x05   ; Load 5 into Register A
MOV R0, #0x03  ; Load 3 into Register R0
CJNE A, R0, NOT_EQUAL ; Compare A and R0

NOT_EQUAL:
MOV R1, #0x01 ; Result stored in R1 indicating inequality
```

Explanation

- **CJNE** compares two registers and jumps to the specified label if not equal.

Question 14: How to communicate between Arduino and Raspberry Pi processor using Zigbee?

```
#include <SoftwareSerial.h>
#define ZB_RX 10
#define ZB_TX 11
SoftwareSerial zigbee(ZB_RX, ZB_TX);
```

```
void setup() {
  Serial.begin(9600);
  zigbee.begin(9600);
  Serial.println("Zigbee Communication Initialized.");
}
void loop() {
  zigbee.println("Hello Raspberry Pi via Zigbee");
  delay(2000);
}
```

Code for Raspberry Pi (Python)

```
import serial
zigbee = serial.Serial('/dev/ttyUSB0', 9600)
while True:
    data = zigbee.readline().decode()
    print("Received:", data)
```

Sample Output

Received: Hello Raspberry Pi via Zigbee

Question 15: Write the program to transfer the data between the memory and accumulator.

Code (Assembly for 8051 Microcontroller)

```
MOV A, 0x30    ; Move data from memory location 30H to accumulator
MOV 0x31, A    ; Move data from accumulator to memory location 31H
```

Question 17: Write a program to add two numbers using Embedded C.

```
#include <stdio.h>
int main() {
    int num1 = 5, num2 = 7, sum;
    sum = num1 + num2;
    printf("The sum is: %d\n", sum);
    return 0;
}
```

Sample Output

The sum is: 12