Answer Sheet for Control System and Sensors & Actuators

Part 1:

1. **What is a system that manages, commands, directs, or regulates the behavior of other devices or systems?**
   - ➢ Answer: Control System
2. **What type of control system operates without feedback?**
   - ➢ Answer: Open-Loop Control System
3. **What is a device that detects changes in physical conditions such as temperature, light, or pressure?**
   - ➢ Answer: Sensor
4. **What is a component in a control system that performs actions based on received signals?**
   - ➢ Answer: Actuator
5. **Which type of motor is commonly used for precise position control?**
   - ➢ Answer: Servo Motor
6. **What is the circuit element that compares input and feedback signals in a closed-loop control system?**
   - ➢ Answer: Comparator
7. **What is a graphical representation of a control system's components and their interactions?**
   - ➢ Answer: Block Diagram
8. **What is the small computer on a single integrated circuit used in control systems like Arduino?**
   - ➢ Answer: Microcontroller
9. **What is the software environment used to program Arduino boards?**
   - ➢ Answer: Arduino IDE
10. **Which function in Arduino is used to read analog input signals?**
    - ➢ Answer: analogRead()
11. **Which function in Arduino is used to set a digital pin to HIGH or LOW?**
    - ➢ Answer: digitalWrite()
12. **What fundamental law relates voltage, current, and resistance in electrical circuits?**
    - ➢ Answer: Ohm's Law
13. **Which sensor measures temperature in control systems?**
    - ➢ Answer: Temperature Sensor
14. **Which sensor detects human or animal motion?**
    - ➢ Answer: Motion Sensor (PIR)
15. **Which sensor uses sound waves to measure distance?**
    - ➢ Answer: Ultrasonic Sensor
16. **Which function in Arduino is used to print text or values to the Serial Monitor?**
    - ➢ Answer: Serial.print()
17. **Which type of motor uses a signal to control its position?**
    - ➢ Answer: Servo Motor
18. **Which type of motor moves in discrete steps?**
    - ➢ Answer: Stepper Motor
19. **Which type of memory is used to store permanent data in microcontrollers?**
    - ➢ Answer: EEPROM (or Flash Memory)
20. **Which electronic component resists the flow of electrical current?**
    - ➢ Answer: Resistor

21. **Which sensor is used to measure the acidity or alkalinity of a liquid?**
    - ➢ Answer: pH Sensor
22. **What is the microcontroller used in Arduino Uno?**
    - ➢ Answer: ATmega328P
23. **What is the operating voltage of most Arduino boards?**
    - ➢ Answer: 5V
24. **What type of feedback amplifies the output and increases system gain?**
    - ➢ Answer: Positive Feedbac
25. **What type of feedback reduces system error and stabilizes performance?**
26. **Answer:** Negative Feedback
27. **What term describes a system that automatically adjusts its output based on feedback?**
    - ➢ Answer: Feedback Control
28. **Which port is commonly used to connect an Arduino board to a computer?**
    - ➢ Answer: USB Port
29. **Which type of sensor detects the level of a liquid in a tank?**
    - ➢ Answer**:** Float Sensor
30. **What is the unit of electrical resistance?**
    - ➢ Answer**:** Ohm
31. **What component produces light when current flows through it?**
    - ➢ Answer: Light Emitting Diode (LED)
32. **Which Arduino function is used to delay execution for a specified time?**
    - ➢ Answer: delay()
33. **What is the name of a device that converts physical phenomena into electrical signals?**
    - ➢ Answer: Transducer
34. **What is a reusable circuit board for prototyping electronic circuits?**
    - ➢ Answer: Breadboard
35. **Which Arduino pin provides a power supply for external components?**
    - ➢ Answer: VCC
36. **Which type of sensor is used in security systems to detect movement?**
    - ➢ Answer: PIR Sensor
37. **What electronic component temporarily stores electrical energy?**
    - ➢ Answer: Capacitor
38. **Which type of motor rotates continuously in either direction without precise position control?**
    - ➢ Answer: DC Motor
39. **Which type of actuator uses compressed air to create motion?**
    - ➢ Answer: Pneumatic Actuator
40. **What programming language is primarily used in Arduino?**
    - ➢ Answer: C++
41. **Which sensor is used in digital cameras to detect light and capture images?**
    - ➢ Answer: Image Sensor

Part 2: Enumeration Questions

Five Main Components of a Control System

1. Sensor
2. Controller
3. Actuator
4. Feedback System
5. Input/Output Interface

Five Examples of Sensors

1. Temperature Sensor
2. Motion Sensor (PIR Sensor)
3. Ultrasonic Sensor
4. Light Sensor (LDR)
5. Pressure Sensor

Five Examples of Actuators

1. DC Motor
2. Stepper Motor
3. Servo Motor
4. Solenoid Actuator
5. Pneumatic Actuator

```
int ledPin = 8; // LED is attached to pin 8
void setup()
{
    pinMode(ledPin, OUTPUT); // makes the ledPin an output
}
void loop()
{
    digitalWrite(ledPin, HIGH); // turns on LED
    delay(5000); // waits for 5 seconds
    digitalWrite(ledPin, LOW); // turns off LED
    delay(3000); // waits for 3 seconds and loops to the
first statement
}
```

Explanation:

1. `pinMode(ledPin, OUTPUT);` → *Configures pin 8 as an output.*
2. `void loop()` → *The function that continuously executes.*
3. `digitalWrite(ledPin, HIGH);` → *Turns on the LED.*
4. `delay(5000);` → *Waits for 5000 milliseconds (5 seconds).*
5. `digitalWrite(ledPin, LOW);` → *Turns off the LED.*
6. `delay(3000);` → *Waits for 3000 milliseconds (3 seconds), then the loop repeats.*

This code makes the LED blink by turning it on for 5 seconds and off for 3 seconds in a loop.

Part 3: Enumeration Questions