



## BRAINWARE UNIVERSITY

Term End Examination 2023-2024

Programme – B.Tech.(RA)-2021

Course Name – Sensor and Actuator Devices for Robotics

Course Code - PEC-ECR602A

( Semester VI )

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

### Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) Define the primary characteristic of the Internet of Things (IoT).
- |                        |                        |
|------------------------|------------------------|
| a) Centralized control | b) Interconnectivity   |
| c) Offline operation   | d) Limited scalability |
- (ii) Duplicate which protocol is commonly used for communication in IoT?
- |         |         |
|---------|---------|
| a) HTTP | b) SMTP |
| c) MQTT | d) FTP  |
- (iii) Ask which IoT level involves integrating sensors and actuators directly into physical objects?
- |            |            |
|------------|------------|
| a) Level 0 | b) Level 1 |
| c) Level 2 | d) Level 3 |
- (iv) Cite which IoT domain focuses on optimizing industrial processes and manufacturing?
- |               |                 |
|---------------|-----------------|
| a) Home IoT   | b) City IoT     |
| c) Energy IoT | d) Industry IoT |
- (v) Act, what is YANG in the context of IoT system management?
- |                                 |                                |
|---------------------------------|--------------------------------|
| a) A data modeling language     | b) A communication protocol    |
| c) A cloud computing technology | d) An edge computing framework |
- (vi) Apply, what is SNMP commonly used for in IoT system management?
- |                      |                         |
|----------------------|-------------------------|
| a) Device monitoring | b) Data encryption      |
| c) Cloud storage     | d) Protocol translation |
- (vii) Calculate, what role does NETOPEER play in IoT system management?
- |  |                                     |
|--|-------------------------------------|
| a) It acts as a network device agent     | b) It serves as a cloud server      |
| c) It functions as a protocol translator | d) It acts as a data analytics tool |
- (viii) Read which of the following is a popular microcontroller board commonly used in IoT projects?
- |                 |           |
|-----------------|-----------|
| a) Arduino      | b) Zigbee |
| c) Raspberry Pi | d) MQTT   |

- (ix) Recite which programming language is commonly used for programming Raspberry Pi in IoT projects?
- a) Python  
b) C++  
c) Java  
d) JavaScript
- (x) Extend which device is commonly used to convert digital signals from a microcontroller to analog signals?
- a) Digital-to-analog converter (DAC)  
b) Analog-to-digital converter (ADC)  
c) Relay  
d) Transistor
- (xi) Explain, which type of motor requires an H-bridge circuit for control?
- a) Servo motor  
b) DC motor  
c) Stepper motor  
d) AC motor
- (xii) Interpret, how do you control the direction of rotation of a DC motor using a microcontroller?
- a) By changing the voltage directly  
b) By using a servo motor  
c) By using PWM signals  
d) By using an H-bridge circuit
- (xiii) Enumerate how does a light sensor detect light intensity?
- a) By measuring electrical resistance  
b) By generating an electrical signal proportional to light intensity  
c) By emitting light and measuring the reflection  
d) By converting light into sound waves
- (xiv) Report the primary function of a cloud storage model?
- a) To store data locally  
b) To provide unlimited storage space  
c) To store data remotely  
d) To host web applications
- (xv) Research the purpose of a communication API in IoT systems?
- a) To provide access to cloud storage  
b) To facilitate communication between IoT devices  
c) To host web applications  
d) To regulate temperature in IoT environments

### Group-B

(Short Answer Type Questions)

3 x 5=15

2. Enumerate two IoT protocols and explain their significance in IoT communication. (3)
3. Discuss the advantages and limitations of using Python for IoT programming on Raspberry Pi. (3)
4. Illustrate the methods employed for speed control of a DC motor in IoT systems. (3)
5. Discuss how cloud computing enhances scalability and flexibility in IoT deployments. (3)
6. Analyze the Internet of Things (IoT) and highlight its key characteristics. (3)

OR

Illustrate sensors and actuators in the context of IoT. Provide examples of each. (3)

### Group-C

(Long Answer Type Questions)

5 x 6=30

7. Define and compare Software Defined Networks (SDN) and Network Function Virtualization (NFV) in the context of IoT deployments. How do they complement each other? (5)
8. Compare and differentiate Arduino and Raspberry Pi in terms of hardware specifications, programming languages, and suitability for different IoT applications. (5)
9. Explain how pulse width modulation (PWM) is used for motor speed control in IoT projects. Provide examples of PWM implementation in controlling motor speed. (5)
10. Compare and discriminate between different types of motion detection sensors used in IoT applications, such as passive infrared (PIR) sensors, ultrasonic sensors, and microwave (5)

sensors.

11. Rewrite the benefits and challenges of using cloud computing for IoT deployments. Discuss scalability, reliability, security, and cost considerations when choosing cloud offerings for IoT projects. (5)
12. Categorize the architecture of an IoT system, detailing the roles of sensors, actuators, communication protocols, and cloud infrastructure. (5)

**OR**

Contrast and compare different IoT communication protocols such as MQTT, CoAP, and HTTP in terms of their efficiency, scalability, and suitability for different applications. (5)

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