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BRAINWARE UNIVERSITY

Term End Examination 2025-2026

Programme – B.Tech.(RA)-2023

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) Enumerate which model is used for communication between IoT devices and servers?
 - a) Peer-to-peer
 - b) Client-server
 - c) Hybrid
 - d) Broadcast
- (iii) Identify what technology enables storage and processing of IoT data remotely?
 - a) Edge computing
 - b) Cloud computing
 - c) Fog computing
 - d) Grid computing
- (iv) Locate which IoT domain involves monitoring and managing urban infrastructure?
 - a) Home IoT
 - b) City IoT
 - c) Energy IoT
 - d) Industry IoT
- (v) Classify which IoT level involves basic connectivity but lacks intelligence or processing capability?
 - a) Level 0
 - b) Level 1
 - c) Level 2
 - d) Level 3
- (vi) Contrast which communication API facilitates interaction between IoT devices and applications?
 - a) RESTful APIs
 - b) SOAP APIs
 - c) GraphQL APIs
 - d) RPC APIs
- (vii) 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
- (viii) Administer, what technology does NETCONF use for secure remote management of network devices?

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 - a) HTTP
 - b) SSH
 - c) FTP
 - d) SNMP

(ix) Articulate, which of the following is a benefit of using NETOPEER in IoT system management?

 - a) Enhanced security
 - b) Improved scalability
 - c) Reduced latency
 - d) Increased power consumption

(x) Read which of the following is a popular microcontroller board commonly used in IoT projects?

 - a) Arduino
 - b) Zigbee
 - c) Raspberry Pi
 - d) MQTT

(xi) Recall what is the primary function of the SPI (Serial Peripheral Interface) on microcontrollers?

 - a) Serial communication between devices
 - b) Analog to digital conversion
 - c) Pulse width modulation
 - d) Real-time clock synchronization

(xii) Repeat what is the primary purpose of I2C (Inter-Integrated Circuit) on microcontrollers?

 - a) Serial communication between devices
 - b) Analog to digital conversion
 - c) Pulse width modulation
 - d) Real-time clock synchronization

(xiii) Predict what is used to control the position of a servo motor accurately?

 - a) Transistor
 - b) Diode
 - c) PWM signal
 - d) Capacitor

(xiv) Contrast what technology is commonly used for hosting web servers in cloud environments?

 - a) Python
 - b) Java
 - c) C++
 - d) Node.js

(xv) Convert the main purpose of a web server in cloud environments?

 - a) To store data
 - b) To regulate temperature
 - c) To provide a user interface
 - d) To host web applications

Group-B

(Short Answer Type Questions)

$$3 \times 5 = 15$$

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. Explain the significance of communication APIs in IoT applications deployed on cloud platforms. (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)

 $5 \times 6 = 30$

7. 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)
8. Analyze the role of GPIO pins in Arduino and Raspberry Pi for IoT applications. How do they enable interaction with the physical world? (5)
9. Discuss the principles of operation of a buzzer and its applications in IoT projects. Provide examples of scenarios where a buzzer can be utilized. (5)
10. Describe the techniques for speed control of DC motors in IoT applications, considering both hardware and software approaches. (5)
11. State the capabilities and applications of embedded sensors in IoT systems, highlighting their integration with microcontrollers and communication protocols for data transmission and (5)

processing.

12. Devise the construction and operation of a temperature sensor with a thermistor. Discuss the advantages and limitations of thermistors compared to other temperature sensing technologies. (5)

OR

Compare and discriminate between different types of motion detection sensors used in IoT applications, such as passive infrared (PIR) sensors, ultrasonic sensors, and microwave sensors. (5)

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