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Sri Lanka Institute of Information Technology

B.Sc. Honours Degree in Information Technology

Specialized in Computer Systems and Network Engineering

Final Examination
Year 4, Semester 2 (2022)

IT4030 – Internet of Things

Duration: 2 Hours

November 2022

Instructions to Candidates:

- This paper has 4 questions.
- Answer all questions in the booklet given.
- The total marks for the paper is 100.
- This paper contains 5 pages, including the cover page.
- Electronic devices capable of storing and retrieving text, including calculators and mobile phones are not allowed.

Question 01 (25 Marks)

a. "Place, Time, and Device (method) were the main three parts of distanced communication before 2010. However, with the introduction of the IoT and the boom of the Internet, place and time no longer matter." Critically evaluate this statement using an example.

(5 marks)

b. IoT eco-system has 7 layers on that. Out of those 7 layers, the Market and Services layers are very important before initiating an IoT project. Discuss the importance of those two layers when initiating an IoT project. You may use an IoT-enabled shopping cart for Sri Lankan Supermarkets as an example. (5 marks)

c. The integration layer of the IoT ecosystem has a function named "Thinking things." Thinking things provide intelligence to smart applications using three different methods: 1) passive, 2) active, 3) automated.

Assume that you must implement an IoT system to turn on the lights and Air conditioner of a lecture hall only when there is a lecture and students are entering the lecture hall. You have several sensors/devices to implement the system: a PIR sensor, a camera, a human operator, a cloud system that can run an AI, and a single unit to turn on the light and AC machine. What are the devices you would use for three systems?

i. A passive system
ii. An active system
iii. An automated system

You have to give justification for the use of the above sensors/devices

(15 marks)

Question 2 (25 Marks)

a. Most of the embedded systems have sensors, Analog-to-Digital Converters, Digital-to-Analog Converters, and actuators. Write down the importance above components in embedded systems

(5 marks)

b. Assume that you are working for the national intelligence services as an IoT design suspected group is in progress secretly in a restaurant, inside a leading hotel in Colombo city and you want surveillance of it. You were advised that the officials wanted to hear the conversation in real-time. However, as this is a highly secret and also the privacy of the location is also important, it is difficult to assign a human to the location for a long time. Therefore, you have to design an embedded system to monitor the environment in real-time and send both audio and video data to the control room.

i. Name the sensors you need to place in the location (5 marks)

ii. Name the devices you need to place in the location (5 marks)

iii. Name the microcontroller board you recommended to this sort of operation and justify your answer.

(5 marks)

iv. Draw your system design.

(5 marks)

Question 3 (25 Marks)

a. What do you mean by MQTT (Message Queue Telemetry Transport Protocol)? What is role of MQTT protocol in IoT? (4 marks)

b. Industrial IoT system, a network of sensors collects critical production data and gives valuable insights into the efficiency of the manufacturing operations. IoT device management plays a critical role to give correct information to the engineering team to monitor and manage the production process. So, we need to manage the IOT system in a reliable way and with the following constrains. Please discuss each of the following, how you do manage the IIOT system efficient way.

i. Provisioning and Authentication
ii. Configuration and Control
iii. Monitoring and Diagnostics
iv. Updates and Maintenance (8 marks)

c. How do wireless communications influence the development and implementation of the internet of things (IoT)? Explain with examples. (4 marks)

d. What impacts will the Internet of Things (IoT) have on the Transportation Sector?

(3 marks)

e. What do you mean by IoT Gateway? What is the role of a gateway in IoT?

(3 marks)

f. What are the major Privacy and Security Issues in the case of the Internet of Things (IoT)? Discuss with a proper example.

(3 marks)

Question 4 (25 Marks)

a. "From January to June of 2021, there were 1.51 billion breaches of IoT devices. Underestimating the importance of cybersecurity when developing IoT systems is unacceptable."

As per the above statement, how do you protect your IoT devices from vulnerabilities? As an IT professional how do you give assurance to your management to mitigate IoT breaches in your implemented system? Please discuss the following.

i. Software and firmware vulnerabilities
ii. Data leaks from IoT system
iii. Insecure communication
iv. Malware risks
v. Cyber attacks (10 marks)

b. What are the best practices for ensuring the security of IoT systems? (4 marks)

c. Describe the secure authentication and access control in constrained devices.

(3 marks)

d. State the difference between IoT and IIoT with examples.

(2 marks)

e. What is the difference between the Internet of Things (IoT) and Machine to Machine (M2M)?
(2 marks)

f. What are the risks and challenges that we should be aware of when it comes to the Internet of Everything?

(4 marks)

--End of Question Paper--