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The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Electrical and Computer Engineering

Study Programme	: Bachelor of Technology Honours in Engineering
Name of the Examination	: Final Examination
Course Code and Title	**: EEX5346 Embedded Systems**
Academic Year	: 2020/21
Date	: 11th February 2022
Time	: 1400-1700hrs
Duration	: **3 hours**

General Instructions

1. Read all instructions carefully before answering the questions.

2. This question paper contains three (3) questions in SECTION A and four (4) questions in SECTION B on three (3) pages.

3. Answer ALL questions in SECTION A. [60 Marks], and answer any TWO questions from SECTION B. [40 Marks]

4. The answer to each question should commence from a new page.

5. This is a Closed Book Test (CBT).

6. Answers should be in clear handwriting.

7. Do not use Red colour pen, and clearly state your assumptions if any

SECTION A: Answer ALL questions. [60 Marks]

Smart Elevator: *A Lift That Thinks Ahead by Giving IoT a Lift*

The following description is about the Smart Elevator: *A Lift That Thinks Ahead by Giving IoT a Lift.* Your task is to analyse the following specifications and design the Smart Elevator.

"*High-rises and skyscrapers only exist due to elevators. As more and more people move to modern-day megacities, the need for rapid transport not only to, but also within, buildings is growing. Here, "smart" elevators will play an increasing and increasingly vital role." Therefore, ordinary elevators are becoming intelligent and connected. "When you enter a building with an appointment, the system will already know where you are heading for. Through a smartphone or a wearable, you will be informed which lift to take." There are many advantages such as Avoiding Unauthorised Access, Predict Destination, Live Elevator Monitoring, Remote Controlling, etc.*
[Reference: https://www.smart-industry.net/smart-elevators-giving-iot-a-lift/]

Design and develop the Smart Elevator IoT application by answering the following questions.

[Q1]

(i) Draw a complete diagram describing the proposed system. [05 Marks]
(ii) Draw a block diagram and show how to integrate each input and output of each module/unit in the diagram in Q1 (i). [05 Marks]
(iii) Draw flowchart(s) to represent the algorithm for the proposed system [10 Marks]
(iv) Write a program[pseudo-code, C, Java, Python, any (mention the name)] for the high-level functions of the proposed system. [10 Marks]

[Q2]

(i) Identify three security concerns in the proposed design. [06 Marks]
(ii) Briefly explain how to mitigate those identified concerns. [09 Marks]

[Q3] Design the following dashboards to visualise the data in the Smart Elevator IoT application.

(i) Mobile Interface for users. [07 Marks]
(ii) PC Interface for monitoring elevators. [08 Marks]

SECTION B: Answer any TWO questions. [40 Marks]

[Q4]

(i) Briefly explain two methods for the power saving approach in such IoT applications. [10 Marks]

(ii) Briefly describe why power optimisation is required for such IoT applications [10 Marks]

[Q5]

(i) List the architectures and applications of persistent storage for embedded systems. [10 Marks]

(ii) Select suitable persistent storage for the proposed design in Q1 and justify your answer. [10 Marks]

[Q6]

(i) What is MQTT, and briefly explain how you incorporate MQTT for your application. [12 Marks]

(ii) List three (3) cloud tools available for data visualisation for IoT applications. [08 Marks]

[Q7]

(i) Briefly explain what the fourth industrial revolution (4IR) is and how it relates to IoT. [10 Marks]

(ii) Briefly describe the main challenges you would have to face when applying the IoT concept to the Smart Elevator IoT application. [10 Marks]