

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)  
ORGANISATION OF ISLAMIC COOPERATION (OIC)

**DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING**

Mid-Semester Examination

Summer Semester, A. Y. 2022-2023

Course No.: EEE 6411

Time: 90 Minutes

Course Title: Wireless Ad Hoc and Sensor Networks

Full Marks: 75

There are **3 (three)** questions. Answer **all 3 (three)** questions. Programmable calculators are not allowed. Do not write on this question paper.

1. a) Explain the flow of data in a typical IoT system, from data collection by IoT devices to data analysis. Discuss the role of IoT hubs or gateways in this process. **12**
- b) Explain the abilities and functionalities of IoT Things (sensors and devices) and how they interact and collaborate with each other in an IoT ecosystem. **8**
2. a) Explain the Internet of Energy (IoE) and the Energy Network (EN) in the context of the Internet of Things (IoT), smart grids, and intelligent energy management (Energy Cloud). **10**
3. a) As an IoT expert, you are being asked to *design an Internet of Energy (IoE) using intelligent devices to provide a suitable scheduling plan for the efficient utilization of smart home appliances* (such as a light, fan, television, air-conditioning, washing machine, electric oven, hairdryer, refrigerator, and so on) and *intelligent energy equipment* (such as smart meters, smart substations, etc.). **25**

Explain how you consider the following factors when designing the above IoE solutions:

- i) Peak hour and off-peak hour,
- ii) Day and night time,
- iii) Summer and winter seasons, and
- iv) Number of occupants.

Justify your answer with appropriate illustrations, diagrams, tables, and flowcharts.

- b) For your above design, **20**
  - i) Explain the IoE network architecture and functionality of your design.
  - ii) Identify and resolve any issues with your design.

Utilize the techniques, skills, and modern engineering tools of data flow mechanisms in the *Internet of Energy (IoE)*.

Your solution should demonstrate a strong understanding of network engineering principles, IoT technologies, and their practical application in solving real-world social and community problems. Provide diagrams, examples, and references to support your ideas.