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University Examinations 2023/2024

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF COMPUTER SECURITY AND FORENSICS AND BACHELOR OF INFORMATION TECHNOLOGY

CCF 3451: INTERNET OF THINGS

DATE: APRIL 2024   **TIME: 2 HOURS**

INSTRUCTIONS: *Answer question **one** and any other **two** questions*

QUESTION ONE (30 MARKS)

a) Discuss three specific technologies that play a key role in enabling the Internet of Things (IoT) while providing a detailed explanation of how each technology facilitates the integration and functioning of IoT devices   (6 Marks)

b) Discuss application of IoT in the following domains

      i.   Home automation   (2 Marks)

     ii.   Augmented Reality   (2 Marks)

   iii.   Block Chain   (2 Marks)

c) Define the term *Internet of Things(IoTs)* and outline any two characteristics.   (3 Marks)

d) Outline any three distinguishing characteristics of IoTs from the 'Traditional Internet'

(3 Marks)

e) Image sensors are commonly found in digital cameras and modules, medical imaging and night vision equipment. Outline the following two main types of sensors used in various devices;

    a.   Charge coupled Devices (CCD)   (2 Marks)

b. CMOS Sensors   (2 Marks)

f) Provide a concise overview of two key transport layer protocols used in IoT systems, highlighting their functions and significance in facilitating communication between IoT devices and networks

(4 Marks)

g) Using a suitable diagram, describe MQTT broker architecture with one use case example

(4 Marks)

QUESTION TWO (20 MARKS)

a) IoTs software addresses key areas of networking and action through platforms, embedded systems and middleware. Using appropriate examples, outline the role of software in each of the following IoT tasks:

    a) Data Collection   (3 Marks)

    b) Device Integration   (3 Marks)

b) Describe the four primary building blocks of an IoT system with the aid of a diagram

(8 Marks)

c) Using a suitable diagram, discuss the layers that constitutes an IoT system   (6 Marks)

QUESTION THREE (20 MARKS)

a) Using appropriate illustrations, explain each of the following communication models as used in IoTs;

    i.   Device to Device   (2 Marks)

    ii.   Device to Cloud   (2 Marks)

    iii.   Device to Gateway   (2 Marks)

    iv.   Back-End Data Sharing   (2 Marks)

b) Using suitable diagrammatic representation, elaborate the differences that exist between the following IoT Levels
- Level 1 vs Level 2   (2 Marks)
- Level 3 vs Level 4   (2 Marks)
- Level 5 vs Level 6   (2 Marks)

c) Using a well labeled diagram, explain the Internet of Things (IoT) value loop   (6 Marks)

QUESTION FOUR (20 MARKS)

a) You are part of the national debate on whether the country should adopt IoT in its ministries.To aid in exploring both sides of the debate, you are requested to oppose the motion using facts why it is not right to implement IoT. Outline some of the key issues/challenges that youwould highlight in the debate   (6 Marks)

b) Discuss how has the adoption of IoT networks impacted mobile networks, considering the diverse and heterogeneous nature of IoT devices and their communication requirements   (5 Marks)

c) The existence of IoTs can be viewed as an integration and evolvement of various computing paradigms. Using appropriate examples, define and explain the place of each of the followingin regard to IoTs;

    i.   Edge Computing   (3 Marks)

    ii.   Fog Computing   (3 Marks)

    iii.   Cloud Computing   (3 Marks)

QUESTION FIVE (20 MARKS)

d) Konza Technolopolis intends to implement a Smart City project. You have been identified to lead the activities involved in the process as well as guiding the team on what they are expected to do. The first task involves identification of the expected architectural requirements.

    i.   Discuss some of the functional and non-functional requirements that you would include in your report   (10 Marks)

    ii.   Outline any five hardware requirements that you enlist to achieve the dream of a smart city   (5 Marks)

    iii. Describe any five software the project may need when implementing the project   (5 Marks)