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University Examinations 2023/2024

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF COMPUTER SCIENCE, BACHELOR OF MATHEMATICS AND COMPUTER, BACHELOR OF SCIENCE IN MATHEMATICS AND BACHELOR OF DATA SCIENCE

CCS 3451: EMERGING TECHNOLOGIES IN COMPUTER SCIENCE

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

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

QUESTION ONE (30 MARKS)

a. Assess the potential benefits and challenges of adopting I0T in transportation infrastructure. List three of each. (6 Marks)

b. You are a small business owner launching a new website. Which cloud computing service (i.e. IaaS, PaaS, SaaS) would be most suitable for your needs? Explain your choice and highlight the key benefits it offers compared to traditional hosting solutions. (5 marks)

c. Imagine you are a VR game developer. Describe the key considerations you would need to address when designing a VR game to ensure a positive user experience, considering aspects like user interface, immersion, and motion sickness. (5 marks)

d. Explain the difference between supervised and unsupervised learning. Choose specific examples of each type of learning and explain how they can be used in real-world applications. (5 marks)

e. Discuss the importance of incident response plans and procedures in managing cybersecurity incidents effectively. (5 Marks)

f. Identify and discuss two challenges associated with edge computing. (4 Marks)

QUESTION TWO (20 MARKS)

a. Discuss the potential benefits and challenges of using wearable IOT devices for healthcare applications. Provide specific examples of such devices and explain how they can improve patient care or health monitoring. Consider the ethical implications and privacy concerns associated with this technology. (7 marks)

b. A local restaurant owner suspects their menu pricing affects customer spending habits. You are hired to analyze their sales data for a year. Describe the steps you would take to explore this relationship. Which data analysis techniques would you use and what insights might you expect to find? (7 marks)

c. Choose a specific industry (e.g., finance, marketing, manufacturing) and discuss how Artificial Intelligence and Machine Learning are currently being used to automate tasks, optimize processes, and gain valuable insights. Briefly mention potential future applications of AI in this industry and their impact on various stakeholders (6 marks)

QUESTION THREE (20 MARKS)

a. You are a financial advisor explaining Bitcoin to a client. Describe the key features of Bitcoin and how it operates without a central authority. Briefly discuss the benefits and risks associated with investing in Bitcoin compared to traditional financial instruments.

(7 marks)

b. You are tasked with explaining blockchain technology to a group of non-technical users. Describe the core principles of blockchain, using an analogy to illustrate its functionality.

Highlight the key advantages of blockchain compared to traditional centralized systems. (7 marks)

c. You are an engineer working on a smart city project to monitor traffic flow and optimize signal light timing. Explain how edge computing can be implemented to improve real-time decision-making at traffic intersections, considering the challenges of latency and bandwidth limitations. (6 marks)

QUESTION FOUR (20 MARKS)

a. Describe how data analytics techniques are employed to detect and prevent financial fraud in banking and finance sectors. Discuss the types of data used for fraud detection, such as transactional data and behavioral patterns. Evaluate the effectiveness of data analytics in mitigating financial risks. (7 Marks)

b. Explain how blockchain enables secure and tamper-resistant digital voting processes. Provide examples of blockchain-based voting projects and their applications in elections, governance, and organizational decision-making. Evaluate the advantages and challenges of implementing blockchain-based voting systems, including privacy concerns and regulatory compliance. (7 Marks)

c. Describe how quantum computing principles can be applied to enhance cryptographic protocols for secure communication. Discuss the concept of quantum key distribution (QKD) and its advantages over classical encryption methods. Provide examples of quantum cryptographic algorithms and their potential impact on cybersecurity. (6 Marks)

QUESTION FIVE (20 MARKS)

a. You are an engineer tasked with designing an IOT system for a smart home. Choose one specific application (e.g., automated lighting, temperature control, security systems and describe the key components of your system. Explain how this system would benefit the residents. (7 Marks)

b. Meru University wants to migrate its on-premises IT infrastructure to the cloud. Discus the key considerations they should evaluate when choosing a cloud provider. Briefly explain any three potential challenges of cloud migration and strategies to mitigate them (7 Marks)

c. Imagine you are an architect presenting a new building design to a client. Explain how augmented reality could be used to visualize the final project in its intended environment and discuss the advantages this offers over traditional methods (6 Marks)