Total no. of Pages: 02

Roll no. 1702

Degree: B.Tech. Semester: 6

END-SEMESTER EXAMINATION, APRIL-MAY, 2024

Course Title: **Internet of Things**
Course Code: **COCSC20**

Duration: 03 Hours

Max. Marks: **50**

Note: - Attempt all questions in the given order only. Missing data/information (if any), maybe suitably assumed & mentioned in the answer.

Q. No.	Question	Marks	CO
Q 1	**Attempt any 2 parts of the following**		
1a	A Consumer is providing the following different Analog values for encoding it into **Digital values.** Explain the solution with diagrammatical representation using ADC. The signal for 8 bits registers with a full-scale range of 50 Volts. a) 34.5 V b) 9.25 V	5	1
1b	**Compare** and contrast edge computing and cloud computing approaches in IoT deployments in a tabular form. How does edge computing **complement** cloud services by processing data closer to the source, reducing latency, and offloading computational tasks, explain using **diagram**?	5	2
1c	Construct an **AIoT** applications for Intelligent Transport System (ITS) to handle emergency vehicles. Define the **communication channels** used for the applications. Define the benefits of the application and explain it with **diagrams**.	5	1
Q 2	**Attempt any 2 parts of the following**		
2a	Discuss the **significance** of Quality of Service (QoS) levels in MQTT messaging. Explain the **differences** between QoS levels 0, 1, and 2. How does each level **ensure** message delivery and reliability, and what are **trade-offs** between them?	5	5
2b	Demonstrate the **message format** of CoAP protocol. Also draw the CoAP **working** in between constrained environment and rest of the word.	3 + 2	2
2c	Explain the **uses** of RFID technology for supply chain mechanism. Explain it with various stages of a sample industrial application for maximal efficient system.	5	3

Q 3	**Attempt any 2 parts of the following**		
3a	Consider a **network scenario** for IoT network (infrastructure less) that contains 20 wireless nodes, connected using **mesh topology**. Client needs to setup a **communication** between X (Sender) to Y (Receiver). Demonstrate the results after applying the proactive, reactive, and geographic routing to the given scenario.	5	4
3b	Explain the **chirp spread** spectrum modulation used in LoRa technology using diagrammatical representation. How does this modulation scheme **enable** long-range communication and **robustness** against noise and interference?	3+2	3
3c	Explore the **scalability** of 6LoWPAN in large-scale IoT deployments. What factors **limit** its scalability, and how can these limitations be **overcome**?	2+3	5
Q 4	**Attempt any 2 parts of the following**		
4a	Explain various wireless **communications boards** available on Raspberry Pi. Construct the ***design*** of Smart home with Raspberry Pi interfacing various hardware devices with neat sketch.	2+3	3
4b	Define a **diagrammatical** network scenario of Xbee enabled IoT devices that are forming the **mesh** topology for transmitting data from one sender to two receivers. This scenario should ~~fulfil the properties~~ of mesh topology.	5	2
4c	**Explain** the following abbreviations: a) UAS b) Various planes in SDN c) SLAM d) GPIO e) GPS	5	1
Q 5	**Attempt any 2 parts of the following**		
5a	*Explain the **working** of PIR Sensor. Interface this PIR (Passive Infrared) sensor to control the lecture hall light while visiting. Explain with diagrammatical **sketch** and **code** of the desired sketch.*	5	1
5b	*What do you understand by the term "Vulnerability"? Mention any five common **vulnerabilities** found in IoT devices. Explain with the help of a diagram, the **different steps** taken by an attacker to launch DDoS attack.*	3+2	4
5c	Discuss *the **role** of blockchain in* **enhancing data privacy and security** in IoT deployments. How does *blockchain* **address** the **challenges** of securing sensitive IoT data?	3+2	2

Total no. of Pages: 02

Roll no. 1702

Degree: B.TECH. Semester: VI

END-SEMESTER EXAMINATION, APRIL-MAY, 2024

Course Title: **High Performance Computing**

Course Code: **CACSC20/COCSC18**

Duration: 03 Hours

Max. Marks: 40

Note: - Attempt all questions in the given order only. Missing data/information (if any), maybe suitably assumed & mentioned in the answer.

<table>
<tr><th>Q. No.</th><th>Question</th><th>Marks</th><th>CO</th></tr>
<tr><td>Q 1</td><td>Attempt any 2 parts of the following</td><td></td><td></td></tr>
<tr><td>1a</td><td>Write an algorithm to implement parallel algorithms for matrix multiplication using the EREW PRAM model. What will be its time complexity?</td><td>4</td><td>CO1, CO3</td></tr>
<tr><td>1b</td><td>Consider the execution of an object code with $2*10^6$ instructions on a 400 MHz processor. The program consists of four major types of instructions. The instruction mix and the number of cycles [CPI] needed for each instruction type are given below based on the result of a program trace experiment:
<table>
<tr><th>Instruction Type</th><th>CPI</th><th>Instruction Mix</th></tr>
<tr><td>Arithmetic and Logic</td><td>1</td><td>60%</td></tr>
<tr><td>Load/Store with cache hit</td><td>2</td><td>18%</td></tr>
<tr><td>Branch</td><td>4</td><td>12%</td></tr>
<tr><td>Memory reference with cache miss</td><td>8</td><td>10%</td></tr>
</table>
i) Calculate the average CPI when the program is executed on a uniprocessor with the above trace results.
ii) Calculate the corresponding MIPS rate based on the CPI obtained in part (a).</td><td>4</td><td>CO1</td></tr>
<tr><td>1c</td><td>S1: Load R1, 1024 /R1 ← 1024/
S2: Load R2, M(10) /R2 ← Memory(10)/
S3: Add R1, R2 /R1 ← (R1) + (R2)/
S4: Store M(1024), R1 /Memory(1024) ← (R1)/
S5: Store M(R2), 1024 /Memory(64) ← 1024/
Where (R_i) means the content of register R_i and Memory(10) contains 64 initially
i) Draw the dependency graph to show all the dependencies.
ii) Are there any resource dependencies if only one copy of each functional unit is available in CPU?</td><td>4</td><td>CO1</td></tr>
<tr><td>Q 2</td><td>Attempt any 2 parts of the following</td><td></td><td></td></tr>
</table>

2a	Explain task decomposition and data decomposition techniques used in parallel computing using suitable examples.	4	CO2
2b	How the even-odd transposition sorting can be performed in a parallel environment and analyze its performance.	4	CO2, CO3
2c	Describe the Parallel Random Access Machine (PRAM) model and its variants.	4	CO2, CO3
Q3	**Attempt any 2 parts of the following**		
3a	Explain the concept of superscalar architectures and how they differ from traditional scalar processors. What are the major challenges associated with maintaining coherence in shared memory SMP systems?	4	CO3, CO4
3b	What are VLIW processors, and how do they achieve instruction level parallelism? Discuss the advantages and limitations of VLIW architectures in comparison to other parallel processing approaches.	4	CO3, CO4

3c	Write the steps of execution with a scoreboard approach. The following set of MIPS instructions is going to be executed in a pipelined system.
	LD F6, 34(R2)
	LD F2, 45(R3)
	MUL F0, F2, F4
	SUB F8, F6, F2
	DIV F10, F0, F6
	ADD F6, F8, F2
	The latencies of - Integer unit : 1 cycle
	Adder unit : 2 cycles
	Multiplier unit : 10 cycles
	Divider Unit : 40 cycles
		4	CO3, CO5

Q 4	**Attempt any 2 parts of the following**		
4a	Let a program have a portion f_E of its code enhanced to run 4 times faster (so $f_1 = 4$), to yield a system speedup 3.3 times faster (so $S = 3.3$). What is the fraction enhanced (f_E)?	4	CO4
4b	Suppose benchmarking reveals that 5% of time on a 64-processor machine is spent on one single processor (e.g.: root node working while all other processors are idle). Compute the scaled speedup using Gustafson's law.	4	CO4
4c	How do the Dhrystone and Whetstone Benchmarks differ from each other?	4	CO4
Q 5	**Attempt any 2 parts of the following**		
5a	Explain the principles behind directory-based cache coherence protocols and their advantages over bus-based approaches.	4	CO5
5b	Discuss scenarios where each memory consistency model would be most suitable, considering factors such as performance, scalability, and ease of implementation	4	CO5, CO1
5c	Explain Lamport's sequential consistency model and how it addresses the challenges of maintaining consistency in distributed systems.	4	CO5, CO4

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Roll no. 1102

Degree: B. Tech. Semester: 6th Course work

END-SEMESTER EXAMINATION, APRIL-MAY, 2024

Course Title: Data Privacy and Security
Duration: 03 Hours

Course Code: CACSE24/COCSE29
Max. Marks: 50

Note: - Attempt all questions in the given order only. Missing data/information (if any), maybe suitably assumed & mentioned in the answer.

Q. No.	Question	Marks	CO
Q 1	**Attempt any 2 parts of the following**		
1a	What are the differences between data privacy, data security and data protection? Give the examples of laws that aim to protect users' data privacy online.	5	CO1
1b	Explain at least three protection measures in order to protect the software.	5	CO1
1c	What is a data protection officer. What is the role of data protection officer.	5	CO2
Q 2	**Attempt any 2 parts of the following**		
2a	Explain the difference between authentication and authorization by explaining its schematic diagram.	5	CO2
2b	Using the client/server model, it is necessary first to connect to the database management system, effectively establishing the complex layers of communication between the local (client DBMS) and the server. What is the role of authentication and authorization while maintaining the database security.	5	CO2
2c	Address the various issues of database security. Further, categorise the access control mechanisms based upon their characteristics.	5	CO3
Q 3	**Attempt any 2 parts of the following**		
3a	What is an avalanche effect. Further, detail the strength of DES by elaborating timing attacks and analytic attack	5	CO2
3b	Explain the difference between DOS and DDOS attacks along with their security solutions.	5	CO3
3c	What is Diffie-Hellman Key exchange. Write the complete pseudocode of it. Further, A and B aggress upon q=353 and a=3; a chooses 97 and B chooses 233 as their secret key. Compute the respective public keys and shared session keys.	5	CO3
Q 4	**Attempt any 2 parts of the following**		
4a	'A' contacts a bank to open a regular savings account. The bank asks 'A' to furnish photocopies of proof of address and identity for KYC formalities. Before collecting the photocopies, the bank should give notice to 'A' stating that the purpose of obtaining the photocopies is completion of KYC formalities. The notice need not be a separate document. It can be printed on the form used for opening the savings bank account. Explain the criticalities that may occur during sharing or maintaining the document while ensuring the data protection act notified by official gazette.	5	CO4
4b	According to Digital Personal Data Protection Act, it shall come into force on such date as the Central Government may, by notification in the Official Gazette, appoint. Different dates may be appointed for different provisions of this Act. Any reference in any provision of this Act to the commencement of this Act shall be construed as a reference to the commencement of that provision. Explain all the digital privacy data protection concerns related to this.	5	CO4
4c	Explain the difference between harm and loss in respect of data protection act notified by official gazette. Explain security and privacy breaches in AIIMS and who are benefitting it from the breaches. Further, explain various solutions in order to avoid breaches.	5	CO5
Q 5	**Attempt any 2 parts of the following**		
5a	What is an IoT? Explain its architecture along with several applications while maintaining the security during processing, analysis and storing of information in the network?	5	CO5
5b	Explain the several security requirements of an IoT along with detailing its access control mechanisms?	5	CO5
5c	Elaborate biometrics technology as research and privacy? Explain its various security issues through proper diagram while feature extraction and biometric comparison of image records?	5	CO5

Total no. of Pages: 02

Roll no. 1708

Degree: BTech (CSE/MAC) Semester: VI

END-SEMESTER EXAMINATION, APRIL-MAY 2024

Course Title: **Computer Hardware Software Workshop**

Course Code: **COCSC19**

03 Hours

Max. Marks: **20**

Attempt all questions in the **given order** only. Missing data/information (if any), maybe suitably assumed & mentioned in the answer.

Q. No.	Question	Marks	CO
Q 1	**Attempt any 2 parts of the following**		
1a	Describe the process of deploying a TinyML model onto a microcontroller-based system.	2	CO1
1b	Discuss the key challenges associated with implementing machine learning models on resource constrained devices. How does TinyML address these challenges?	2	CO1
1c	Provide a case study or real-world example of a successful TinyML application deployed in a specific industry or domain. Analyze the challenges faced during the deployment process and evaluate the overall impact of the TinyML solution.	2	CO5
Q 2	**Attempt any 2 parts of the following**		
2a	Explain the concept of automation in data analysis using R language. Provide examples of tasks that can be automated in the data preprocessing, analysis, and visualization phases.	2	CO2
2b	Describe the role of R language in data visualization. Discuss the advantages of using R's visualization libraries for creating interactive and customizable visualizations.	2	CO2
2c	Describe any four visualization techniques/plots using R libraries for any given dataset.	2	CO2
Q 3	**Attempt any 2 parts of the following**		
3a	How do tools like Power BI help organizations make better decisions? Provide some examples.	2	CO3
3b	Discuss the role of advanced analytics features in Power BI, such as predictive analytics, clustering, and anomaly detection.	2	CO3
3c	Provide a case study or real-world example of how Power BI has been used to solve a specific business problem or address a particular challenge.	2	CO5
Q 4	**Attempt any 2 parts of the following**		
4a	Discuss the significance of distributed databases in the context of artificial intelligence (AI) applications. How do distributed databases facilitate large-scale data processing and machine learning tasks in AI systems?	2	CO4
4b	Explain the concept of Apache Spark and its role in distributed data processing and analytics.	2	CO4

4c	Provide a case study or real-world example of how Apache Spark has been used to build and deploy AI applications at scale.	2	CO5
Q 5	**Attempt any 2 parts of the following**		
5a	Define DevOps and explain its importance in the context of AI development. Discuss how the principles of DevOps can be applied to streamline development, deployment, and maintenance of AI systems.	2	CO5
5b	Discuss the challenges specific to implementing DevOps in AI projects.	2	CO5
5c	Describe a capstone project that leverages an open-source framework specifically designed for implementing DevOps methodologies and practices.	2	CO5