भारतीय सूचना प्रौद्योगिकी संस्थान कोटा
INDIAN INSTITUTE OF INFORMATION TECHNOLOGY KOTA

B.Tech. (CSE& ECE)
End Term Examination, Odd Semester 2023-24
Computer Architecture and Organization (CST201)

Marks: 40 **Time: 120 minutes** **Date: December 15, 2023**

All Questions are Compulsory.

Q1. Design a Datapath for 5 stage pipelines (IF, ID, IE, DM and WB) for given instructions I1 and I2.
I1: ADD R1, R2, R3, I2: SW R1, 8(R4).
Find out the number of stall cycles with and without operator forwarding/ bypassing. Calculate the effective CPI.

Q2. Calculate the no of stall cycles as well as effective CPI for the following set of Instructions with and without bypassing in pipeline architecture.
A. I1: ADD $1, $2, $3, I2: LW $4, 8($1)
B. I1: LW $1, 8($2), I2: LW $4,8($1)

Q3. Why branch delay slot is created and give a suitable example to reduce the delay slot cycle.

Q4. A super scalar processor has different pipeline stages for the different functional unit (ALU). Create a scenario for the out-of-order execution of instructions. List the possible solution of OOO executions.

Q5. Why cache is faster? explain the 3C's principal of the cache memory miss. How cache miss can be reduced.

Q6. A system has main memory size 32 GB, cache size 512 KB and block size =1KB. Find out the tag bit and Tag directory size for the following mapping algorithms.
1. Direct map
2. Set associative when cache is 2-way set associative.

Q7. Define the following Terms:
A. CISC Vs RISC
B. Hit vs Miss Rate
C. CPU performance vs Power Budget

Q8. Explain the performance evaluation of multi-core architecture.

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY KOTA

B.Tech. (CSE), Semester – III

End Term Examination, Odd Semester 2023-24

DBMS (CST203)

Marks: 50 Time: 2 Hrs Date: Dec. 13 2023

Note 1: Take suitable assumptions, if needed anywhere. Clearly write them.

2. All questions are compulsory.

3. Missing parameters or values may be assumed.

Q 1	(a) Consider the following COMPANY database EMP(Name,SSN,Salary,SuperSSN,Gender,Dno) DEPT(DNum,Dname,MgrSSN,Dno) DEPT_LOC(Dnum,Dlocation) DEPENDENT(ESSN,Dep_name,Sex) WORKS_ON(ESSN,Pno,Hours) PROJECT(Pname,Pnumber,Plocation,Dnum) Write the **relational algebra** queries for the following (i)Retrieve the name, address, salary of employees who work for the Research department. (ii) find the names of employees who work on all projects controlled by department number4. iii) Retrieve the SSN of all employees who either in department no :4 or directly supervise an employee who work in department number :4 (iv) Retrieve the names of employees who have no dependents (v) Retrieve each department number, the number of employees in the department and their average salary.	5 M
	Consider the following relation schema Works(Pname,Cname,salary) Lives(Pname,Street,City) located_in (Cname, city) Manager(Pname,Mgrname) Write the SQL queries for the following i) Find the names of all persons who live in the city Bangalore. ii) Retrieve the names of all person of "Infosys" whose salary is between Rs .50000 and 60000 iii) Find the names of all persons who lives and work in the same city iv) List the names of the people who work for "Tech M" along with the cities they live in. (v) Find the average salary of "Infosys" persons .	6 M

Q 2 Only one	(a)	Consider the following COMPANY database EMP(Name,SSN,Salary,SuperSSN,Dno) DEPT(DNum,Dname,MgrSSN,Dno) DEPT_LOC(Dnum,Dlocation) DEPENDENT(ESSN,Dep_name,Sex) WORKS_ON(ESSN,Pno,Hours) PROJECT(Pname,Pnumber,Plocation,Dnum) Write the **SQL** queries for the following i) Retrieve the name of the employee who works with same department as ravi ii) Retrieve the number of dependents for an employee "Ravi" iii) Retrieve the name of the managers working in location "DELHI "who has no female dependents iv) List female employees from Dno=20 earning more than 50000 v) List "CSE" department details	5M
	(b)	Consider the relation schema R(A,B,C,D,E,F) and the functional dependencies A->B,C->DE,AC->E, D->What is the primary key of this relation R? What is its highest normal form? Preserving the dependency, decompose R into third normal form.	5 M
Q3 only one	(a)	Write the algorithm to find the minimal cover for a sets of FD's Consider R={A,B,C,D,E,H} .FD's {A->C,AC->D,E->AD,E->H} Find the irreducible cover for this set of FD's(minimal cover)	5 M
	(b)	Given below are two sets of FD's for a relation R(A,B,C,D,E,H).Are they equivalent? F={A->C,AC->D,E->AD,E->H} and G={A->CD,E->AH}	5M
Q4.	(a)	List and explain ACID Properties	2 M
	(b)	Check whether given schedule is serializable or not using precedence graph. Explain with algorithm. S1:R1(X) R2(Z) R1(Z) R3(X) R3(Y) W1(X) W3(Y) R2(Y) W2(Z) W2(Y)	5 M
	(a)	Explain why concurrency control is required?	4 M
Q.5	(b)	Write short notes on the following I. transaction rollback and cascading rollback. II. shadow paging III. NO-UNDO/REDO Recovery Based on Deferred Update IV. Recovery Techniques Based on Immediate Update	8 M

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INDIAN INSTITUTE OF INFORMATION TECHNOLOGY KOTA

B.Tech. (CSE), Semester – III

End Term Examination, Odd Semester 2023-24

Subject: Discrete Mathematical Structures (MAT201)

Marks: 40 **Time: 02 Hours** **Date: 14 Dec. 2023**

Attempt all the questions.

1.	a) How many nonnegative integer solutions to the equation $x_1 + x_2 + x_3 + x_4 + x_5 + x_6 = 10$.	2
	b) Determine the coefficient of x^{15} in $f(x) = (x^3 + x^4 + x^5 + \cdots\cdots)^3$.	3
2.	a) Let G be a group and H_1, H_2 are two subgroups of G. Then, prove or disprove that $H_1 \cup H_2$ is always a subgroup of G.	3
	b) Show that a finite cyclic group of order n is isomorphic to $\mathbb{Z}_n$, the group of integers modulo n.	4
	c) Verify that U_{14} is a cyclic group or not, under the multiplication modulo 14, where U_{14} is the set of integers less than 14 and relatively prime to 14.	3
3.	a) Consider a function $f: \mathbb{R} \to \mathbb{R}$ such that $f(x) = e^{2\sin x + 3\cos x + 5}$. Is it one-one and onto function?	2
	b) A deposit of $100000 is made to an investment fund at the beginning of a year. On the last day of each year two dividends are awarded. The first dividend is 20% of the amount in the account during that year. The second dividend is 45% of the amount in the account in the previous year. (i) Find the recurrence relation for $\{P_n\}$, where P_n is the amount in the account at the end of n years if no money is ever withdrawn? (ii) How much is in the account after n years if no money has been withdrawn?	1+3

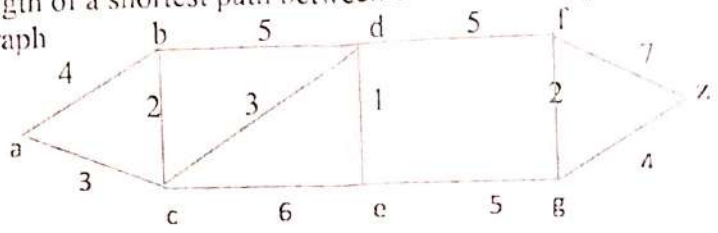
4. a) Can a simple graph exist with 25 vertices each of degree five? 1

b) Draw a graph with the adjacency matrix 2

$$\begin{bmatrix} 0 & 3 & 0 & 2 \\ 3 & 0 & 1 & 1 \\ 0 & 1 & 1 & 2 \\ 2 & 1 & 2 & 0 \end{bmatrix}.$$

c) What is the sum of the entries in a column of the incidence matrix for an undirected graph? 1

d) Find the length of a shortest path between a and z in the given weighted graph 3



5. a) Write a logical argument for the given statement using predicates, quantifiers and logical connectives. "All clear explanations are satisfactory. Some excuses are unsatisfactory. Therefore, some excuses are not clear explanations" (assuming that the domain of discourse consists of all English text). 2

b) Prove that, for all positive integer n, 3

$$\frac{1}{\sqrt{1}} + \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} + \cdots\cdots\cdots + \frac{1}{\sqrt{n}} > 2\left(\sqrt{n+1} - 1\right).$$

6. a) Find the number of positive integers not exceeding 1000 that are either the square or the cube of an integer. 3

b) Suppose that $f: A \longrightarrow A$ be a one-one function. Then show that $f^n : A \longrightarrow A$ is a one-one function for all integers $n \geq 1$. 2

c) Let A and B be two sets. Prove that 2

$$A \Delta B = (A - B) \cup (B - A) = (A \cup B) - (A \cap B).$$

Indian Institute of Information Technology Kota
Department of CSE
ECT211- Microprocessors and Microcontrollers
II Year III Semester End Semester Examination-2023

Time: 120 Minutes Date: 12/12/2023 Max. Marks: 40

Note: Attempt all questions.

Q. 1 Differentiate between Interrupts and Exceptions? Classify the various types exceptions and how are they handled in ARM processors? Write Software interrupt handler execution steps.

[5 Marks]

Q.2 Define CPSR and SPSR. What is the primary purpose of these registers in the ARM architecture? Explain the key flags present in the CPSR. How are these flags used to represent the current state of the processor during program execution?

[5 Marks]

Q.3 Discuss the concept of byte, half word, and word operations in ARM load and store instructions. How does ARM handle different data sizes during memory access? Define big endian and little endian. How do they differ in terms of storing multi-byte values in memory?

[5 Marks]

Q.4 Explain the key components of the AMBA architecture. What are the major buses defined by AMBA, and what roles do they play in a typical SoC design?

[5 Marks]

Q.5 Define the Thumb instruction set. How does it differ from the regular ARM instruction set in terms of instruction length and encoding?

[5 Marks]

Q.6 Describe the basic formats of ARM instructions. How are ARM instructions encoded, and what are the key fields in an instruction format?

OR

Discuss the data processing instructions in ARM. What are the fundamental operations that can be performed on data, and how are these instructions structured?

[5 Marks]

Q.7 Describe the IEEE 754 standard for floating-point representation. What are the formats and characteristics of half precision, single precision and double precision representations? Represent the following values in half-precision, single-precision, and double-precision.

a. 1.5
b. 3.0
c. -4.5
d. -0.46875

[5 Marks]

Q.8 (a) Compare the pipeline depth of ARM processors with a 3-stage architecture to those with a 5-stage architecture.

Q.8 (b) Describe the basic operating modes in ARM architecture. What is the purpose of each operating mode, and how do they differ?

[5 Marks]

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY KOTA
Mid Term Examination, Autumn Semester 2023-24

B. Tech. Computer Science and Engineering (III Semester)

Marks: 40 **CST 205 – Software Engineering** Time: 120 mins

Compulsory Question

1. Draw the Class and Object Diagrams for the Student Grading System for a Semester. 10M

Answer any 3 Questions

2. A. Compare characteristics of Agile and Spiral Process models. Discuss the pros and cons for each. 5M
   B. Explain User Stories and Test-first development 5M

3. A. Discuss the importance of Reuse in Implementation of a software 5M
   B. Discuss the Architectural Design decisions 5M

4. A. Discuss the three methodologies that led to the development of UML. 4M
   B. Discuss the things that form the building blocks of UML. 6M

5. A. Discuss the Use Case, Sequence and Activity Diagrams with examples for few sub modules of a Student Grading System for a Semester. 6M
   B. Discuss about Collaboration Diagrams and compare them with Sequence Diagrams 4M

6. A. Explain Release Testing and User Testing and Compare them. 4M
   B. Draw a neat diagram for Software Testing Process. Explain three testing stages in the Software Testing in detail. 6M