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

Marks: 30   Time: 90 minutes   Date: October 20, 2023

All Questions are Compulsory.

Q1. Consider a processor with three instruction classes A, B and C, with the corresponding, CPI values being 1, 2 and 3 respectively. The processor runs at a clock rate of 1 GHz. For a given program written in C, two compilers produce the following executed instruction counts.

	Instruction Count (IC) in Millions		
	IC-A	IC-B	IC-C
Compiler 1	7	2	1
Compiler 2	12	1	1

1.4×10^{-8}
7.15×10^{2}
—————
1.71×10^{-8}
8.23×10^{2}

Compute the MIPS rating and the CPU time for the two program versions. Justify that MIPS rating is no longer consider for the performance comparison of two processor.

[6]

Q2. Illustrate the fundamental difference of architecture and organization of RISC and CISC.

[6]

Q3. A processor has 50% ALU Instructions and 20% memory instructions. Implementing a faster ALU enhance the ALU performance by 3X. A faster cache implementation and organization make memory operation 2X time faster. For what value of memory fraction that will lead, or equal performance enhanced the overall system with compared to ALU enhancement. 0.667

[6]

Q4. Write an assembly code for creating the record of 10 students, which have 3 subjects: S1, S2 and S3. Find out the cumulative some of each subject for 10 students and store back all result at memory some Memory Location. (If you feel to assume some data or address you can mention explicitly.)

[6]

Q5. What the design metrics for design a system. Explain following term:
   1. Denard Scaling and Power Wall V/s Performance
   2. Transistor density and Computing Capabilities
   3. Compute v/s Communication architecture

tells about number density

[6]

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

All questions are compulsory.

Question 1. Design an ER diagram for a university's course registration system. Entities should include "Student," "Course," "Professor," and "Registration." Indicate how students enroll in courses, the professors who teach the courses, and any additional information relevant to this system (Use all the notations of E-R diagram for this database).   [5 Marks]

Question 2. The following narrative describes a simplified version of the organization of Olympic facilities planned for the summer Olympics. Draw an EER diagram that shows the entity types, attributes, relationships, and specializations for this application. State any assumptions you make. The Olympic facilities are divided into sports complexes. Sports complexes are divided into one-sport and multisport types. Multisport complexes have areas of the complex designated for each sport with a location indicator (e.g., center, NE corner, and so on). A complex has a location, chief organizing individual, total occupied area, and so on. Each complex holds a series of events (e.g., the track stadium may hold many different races). For each event there is a planned date, duration, number of participants, number of officials, and so on. A roster of all officials will be maintained together with the list of events each official will be involved in. Different equipment is needed for the events (e.g., goal posts, poles, parallel bars) as well as for maintenance. The two types of facilities (one-sport and multisport) will have different types of information. For each type, the number of facilities needed is kept, together with an approximate budget.   [6 Marks]

Question 3. Suppose you have two tables, "Employees" and "Managers," with attributes "EmployeeID" in both. Write a relational algebra expression to find the EmployeeIDs of employees who are not managers (i.e., who do not appear in the "Managers" table).   [4 Marks]

Question 4. Consider the LIBRARY relational database schema shown in Figure 1, which is used to keep track of books, borrowers, and book loans. Referential integrity constraints are shown as directed arcs in Figure 1. Write down relational expressions for the following queries: [6 Marks]

a. How many copies of the book titled The Lost Tribe are owned by the library branch whose name is 'Sharpstown'?

b. How many copies of the book titled The Lost Tribe are owned by each library branch?

c. Retrieve the names of all borrowers who do not have any books checked out.

BOOK

Book_id	Title	Publisher_name

BOOK_AUTHORS

Book_id	Author_name

PUBLISHER

Name	Address	Phone

BOOK_COPIES

Book_id	Branch_id	No_of_copies

BOOK_LOANS

Book_id	Branch_id	Card_no	Date_out	Due_date

LIBRARY_BRANCH

Branch_id	Branch_name	Address

BORROWER

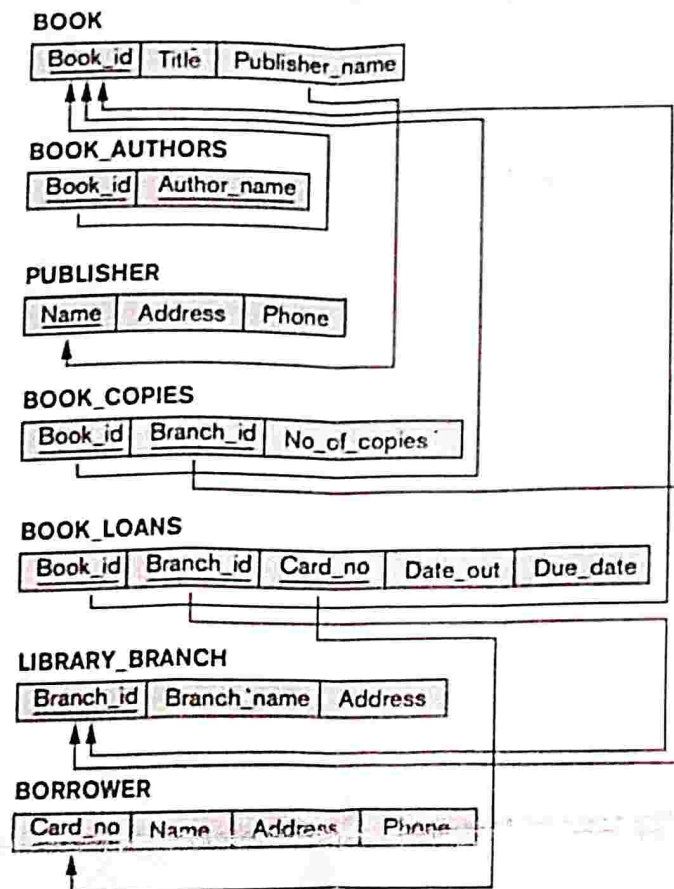| Card_no	Name	Address	Phone

Figure 1: Library Database

Question 5. (a) How Primary key can be derived from superkey, explain with example where candidate keys are there. Can Primary key be Null?   [5 Marks]

(b) Consider the following relations for a database that keeps track of business trips of salespersons in a sales office: SALESPERSON(Ssn, Name, Start_year, Dept_no) TRIP(Ssn, From_city, To_city, Departure_date, Return_date, Trip_id) EXPENSE(Trip_id, Account#, Amount) A trip can be charged to one or more accounts. Specify the foreign keys for this schema, stating any assumptions you make.   [4 Marks]

भारतीय सूचना प्रौद्योगिकी संस्थान कोटा

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY KOTA

B.Tech. (CSE), Semester – III

Mid Term Examination, Odd Semester 2023-24

Subject: Discrete Mathematical Structures (MAT201)

Marks: 30   Time: 90 Minutes   Date: 19 Oct. 2023

1. Let A, B and C be sets such that $(A \cap C) \cup (B \cap C') = \emptyset$ then prove that $A \cap B = \emptyset$, where C' is the complement of C.   [5]

2. Let R be a relation defined on the set $Z^* = Z - \{0\}$ such that
   $a, b \in Z^*$, $a R b$ if and only if $\frac{a}{b} = 2^m 3^n$, $m, n \in \{0,1,2,3, \dots \dots \}$.
   Then show that R is a partial ordering relation on Z^*.   [5]

3. How many ways are there to assign six different jobs to four employees if every employee is assigned at least one job? 4320 [5]

4. Show that $n^3 - 7n + 3$ is divisible by 3 for all positive integers n.   [5]

5. In a class of 35 students, 15 students have taken computer science and 10 students have taken computer science but not mathematics. Find the number of students who have
   (a) Mathematics and computer science both 5
   (b) Mathematics but not computer science. 20 [5]

6. Determine whether $(\sim q \wedge (p \rightarrow q)) \rightarrow \sim p$ is a tautology.   [5]

Indian Institute of Information Technology Kota
Department of Computer Science and Engineering
ECT211- Microprocessors and Microcontrollers
II Year III Semester Mid Term Examination-2023

Date: 17/10/2023

Time: 90 Minutes

Max. Marks: 30

Q. 1 Draw a block diagram representing the key components of a 3-stage pipeline architecture of ARM processor. Label each stage and describe the function of each component in the diagram.

[3+3]

OR

Draw the pin diagram of 8085 microprocessor and label each pin. Also, write short notes on the following:
a) Addressing modes
b) Interrupts

[2+2+2]

Q.2 Describe the use of the LDRH and STRH instructions in ARM assembly language. Provide an example of loading and storing a half word from and to memory. What is the purpose of the LDM and STM instructions in the ARM instruction set? Provide an example of using LDM to load multiple registers from memory.

[3+3]

OR

Write down the special features of ARM7 processor and Compare the ARM7 Processor with x86 Processor. Also discuss the modes of operations of ARM7 processor.

[4+2]

Q.3 (i) For given ARM Assembly level program:

```
        AREA program,CODE,READONLY
        ENTRY
START
        LDR r0,=0XF631024C
        LDR r1,=0X17539ABD
        EOR r0,r0,r1
        EOR r1,r0,r1
        EOR r0,r0,r1
STOP    B       STOP
        END
```

a) After execution of first EOR instruction, what is the value of register r0?
b) After the execution of Second EOR instruction, what is the value of register r1?
c) After the execution of Third EOR instruction, what is the value of register r0, r1 and r15(PC)?

(ii) write an assembly language code for the function given below:

```
Sum=0;
for(i=0; i<6; i++){
Sum=Sum+i;}
```

[4+2]

OR

WAP to find the factorial of 5(Five) using ARM instruction set. Also, write an assembly language code for the function given below:

```
j=100;
While (j!=0)    {
//do something
j--; }
```

[4+2]

Q.4 (i) What constant would be loaded into register r7 by the following instructions?

    a)   MOV r7, #0x8C, 4

    b)   MOV r7, #0x42, 30

    c)   MVN r7, #2

    d)   MVN r7, #0x8C, 4

(ii) What's wrong with the following ARM7TDMI instructions?

    a) STMIA r5!,{r5,r4,r9}

    b) SRMDB r15!{r0-r3,r4,1r}

                                                          [4+2]

Q.5 (i) what will the value of the registers r0, r1 and r2 after execution of the program?

                AREA program,CODE,READONLY

                ENTRY

      START

                MOV r0,#0x11

                LSL r1,r0,#1

                LSL r2,r1,#1

      Stop   B Stop

                END

(ii) Assume that memory and ARM7TDMI registers r0 through r3 appear as follows:

Address	
0X8010	0x00000001
0X800C	0xFEEDDEAF
0X8008	0x00008888
0X8004	0x12340000
0X8000	0xBABE000

	Register
0x13	r0
0xFFFFFFFF	r1
0xEEEEEEEE	r2
0x8000	r3

Describe the memory and register contents after executing the instruction

LDMIA r3!, {r0,r1,r2}

                                                          [2+4]

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

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

Marks: 30   **CST 205 – Software Engineering**   Time: 90 mins

Compulsory Question

1. Prepare a Software Requirement Specification Document for Student Grading System for a Semester.

Answer any 5 Questions

2. Define Change anticipation and Change avoidance and tolerance? What are the proposed models to handle them. Compare the pros and cons of the two models?

3. Discuss the four key practices in Extreme Programming with their advantages.

4. Describe Process Flow in Scrum Framework with a neat diagram. Discuss the terms – Scrum Master, Sprint Cycle, Scrum Meeting, and Product Backlog

5. Compare Functional and Non – Functional requirements. Explain the metrics for specifying non-functional requirements

6. Discuss the three classes of Non-Functional Requirements. List the three requirements for the Student Grading System.

7. Write short notes on the following:
   a. Requirement Elicitation
   b. Ethnography
   c. Go No Go Decision
   d. Hooker's General Principles
   e. UML