

NATIONAL INSTITUTE OF TECHNOLOGY JAMSHEDPUR

Department of Computer Science and Engineering

Even Mid Semester Examination-2024

CSE (2nd Year): 4th Semester

Course Name: Computer Organization and Architecture

Course Code: CS1402

Time: 02 Hour

Max. Marks: 30

Name of Faculty: Dr. Amit Majumder

Note: Attempt all the questions. Assume suitable missing data if any.

- 1) A) What are the maximum and minimum integers representable in n-bit using signed magnitude, signed 1's complement and signed 2's complement? Represent integer number -19 in 8-bit format using signed magnitude and signed 2's complement.

[3+2]

- B) Represent following decimal numbers in IEEE 754 single precision format. [2]

i. -1.75

ii. 21

- C) Use 8-bit 2's complement integers to perform following computations. [3]

i. $(-34) + (-12)$

ii. $18 - (-5)$

- 2) A) Write the sequence of microoperations for push and pop operation to implement register stack. [3]

- B) Write the sequence of two address instructions for the following statement, where A, B, C, D, E and X are memory addresses.

$$X = (A+B) - (C+D) \times E$$

[2]

- C) Describe Booth's multiplication algorithm with necessary diagram. Use this algorithm to multiply -6 by 7. Show register values after every iteration. [5]

PTO

3) A) Describe the sequence of control signals to be generated to fetch instruction from memory in a single bus organization. Draw necessary diagrams to support your explanation. [4]

B) Show the circuit diagram to implement the following operation, where, T_2 and T_5 are the timing signals generated from 3-bit sequence counter. A and B are single bit inputs. AC is 8-bit accumulator.

If $(T_2 B \bar{A} = 1)$ or $(T_5 A = 1)$ then

$AC \leftarrow 0$ [2]

C) A digital system has a common bus system for k registers of n bits each. Suppose, multiplexers are used to design the bus system. What size of multiplexers is needed?

How many multiplexers will be needed? Show the design of this bus system using multiplexers. [4]



National Institute of Technology, Jamshedpur
(An Institution of National Importance under MHRD, Government of India)

2023-2024
Even mid Semester Examination

Course Code: CS 1403
Course Name: Operating System
Instructor Name: Dr. Subrata Dutta
Duration: 2hr Max.
Date of Examination: 19/03/2024

Marks: 30
Shift: B

1. Consider the following snapshot of a system and answer the following questions using Banker's Algorithm.

	Allocation ABC	Max ABC	Available ABC
P0	0 1 0	7 3 5	3 3 2
P1	2 0 0	3 2 2	
P2	3 0 2	9 0 2	
P3	2 1 1	2 2 2	
P4	0 0 2	4 3 3	

- a) What is the content of the matrix?
b) Is the system in a safe state? If yes then what is the safe sequence.

2. Assume the following jobs to execute with one processor and answer the following

Jobs	Arrival Time(ms)	Burst Time (CPU)
1	0	3
2	2	6
3	4	5
4	6	4
5	8	2

- a) Give a GANTT chart for the executing of these jobs using SRTF algorithm.
b) Calculate the average Turnaround time, Average waiting time and throughput.

3. Define binary semaphore along with its advantages and disadvantages.

4. What is deadlock? What are the necessary conditions for deadlock? Explain

5. What is process synchronization? Why it is needed? Define critical section

6. Write short notes on-

- a) PCB b) Thrashing

National Institute of Technology, Jamshedpur
Fourth Semester (Mid-Sem) Examination - March 2024

Branch: B.Tech (2nd Year)

Course Name: DBMS

Course Code: CS1401

Max. Marks: 30

Time: 2 Hours

Course Instructor: Dr. Dinesh Kumar

Instructions:

1. All questions are compulsory. All the subparts of a question are to be attempted together.
2. Refer the University Database Schema given below to solve the questions related to University Database

classroom(building, room_number, capacity)department(dept_name, building, budget)course(course_id, title, dept_name, credits)instructor(ID, name, dept_name, salary)section(course_id, sec_id, semester, year, building, room_number, time_slot_id)teaches(ID, course_id, sec_id, semester, year)student(ID, name, dept_name, tot_cred)takes(ID, course_id, sec_id, semester, year, grade)advisor(s_ID, i_ID)time_slot(time_slot_id, day, start_time, end_time)prereq(course_id, prereq_id)

Marks

- Q 1
- a) Write an SQL query using '*natural join*' to list the names of students along with the titles of courses that they have taken. [2]
 - b) Write an SQL query using '*with*' clause to find all departments where the total salary is greater than the average of the total salary at all departments. [2]
 - c) Consider the entity set instructor with the additional attribute phone number. [2]

Instructor
<u>ID</u>
name
salary
phone_number

For the above entity, in what scenario, *phone_number* can be modelled as a separate entity? Justify your answer.

- d) What is the difference between candidate key, primary key and super key for a given relation? [2]
 - e) Explain briefly the difference between two-tier and three-tier application architectures. [2]
- Q 2
- a) Consider the bank database and employee database given below: [5]

branch(branch_name, branch_city, assets)

customer (ID, customer_name, customer_street, customer_city)

loan (loan_number, branch_name, amount)

borrower (ID, loan_number)

account (account_number, branch_name, balance)

depositor (ID, account_number)**Bank database**employee (ID, person_name, street, city)works (ID, company_name, salary)company (company_name, city)**Employee database**

Give an expression in the relational algebra for each of the following queries for bank database:

- Find the name of each branch located in "Chicago".
- Find the ID of each borrower who has a loan in branch "Downtown".

Give an expression in the relational algebra for each of the following queries for employee database:

- Find the ID and name of each employee who does not work for "BigBank".
- Find the ID and name of each employee who earns at least as much as every employee in the database.

b) With reference to the university schema, write the following SQL queries:

[5]

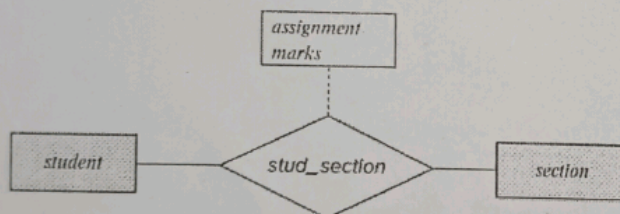
- Update the salary of each instructor to 10000 times the number of course sections they have taught.
- Find all sections that had the maximum enrollment (along with the enrollment), using a subquery.
- Using the university schema, write an SQL query to find the ID and name of each instructor who has never given an A grade in any course she or he has taught. (Instructors who have never taught a course trivially satisfy this condition.)
- Find the names of all students who have taken any Comp. Sci. course ever (there should be no duplicate names)
- Create your own query: define what you want to do in English, then write the query in SQL

c) For university schema, list the entity sets and relationship sets along with their attributes and primary keys/foreign keys. Ensure that all entity and relation sets do not have the redundant attributes. Then, draw the complete ER Diagram for the same by showing all cardinality and participation constraints.

[5]

d) Suppose it is decided to represent the marks that a student gets in different assignments of a course offering (*section*). One way to incorporate the above change in the ER model is given below:

[5]



Answer the following questions related to the above ER diagram:

- What are the issues/errors with the above ER diagram?
- Re-draw the correct ER diagram (at least 2) that correctly incorporates the above requirement.

*****End of Question Paper*****