[This question paper contains 6 printed pages.]

4702　　　　　　　　　　*Your Roll No.* ....

COMPUTER SCIENCE – Paper V

(Data Base Systems)

(Admissions of 1999 and onwards)

Time : 3 Hours　　　　　*Maximum Marks : 38*

*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

All *questions are compulsory.*

1. (a) Explain the following terms giving suitable example for each

    (i) Derived attribute

    (ii) Multi-valued Attribute　　　　　(3)

    (b) What anomalies might arise if referential integrity constraint is not satisfied in a relational schema ?

    　　　　　　　　　　　　　　(2)

2. Define the following terms :

    (a) Functional Dependency

    (b) Specialization

    (c) Weak entity

    　Use appropriate examples to explain　　(6)

    　　　　　　　　　　　　P.T.O.

3. Consider the following set of requirements for a University database :

The University keeps track of each student's name, roll_no, social security number, address, phone, dateofbirth, sex, class, dept. and course taken. Some applications will need to refer to the last name of the student and city, state and pin code of the address. Both SSN and roll_no have unique values for each student. Each department has a name, dept.code, and phone no. Both dept name and code have unique values for each dept. Each course has a Course name, course number, no of semesters, hours and offering department. The value of course no. is unique for each course. Each section has a instructor, year, course_no and section no. The section number distinguishes the sections of the same course being taught during the same semester. A grade report has student, section and grade.

Draw an ER diagram for the above database Specify key attributes of each entity type and the structural constraints on each relatioiship type. State any additional assumptions that yu make. (5)

4. Consider the following reltional schema for a restaurant.

EMPLOYEE

Employee_No	Name	Skill	Pay_rate
123456	Ron	Waiter	7.50
123457	Jon	Bartender	8.79
123458	Don	Busboy	4.70
123459	Pam	Hostess	4.90
123460	Pat	Bellboy	4.70
123461	Ian	Steward	9.00
123471	Pierre	Chef	14.00
123472	Julie	Chef	1450

POSITION

Duty_no	Skill
321	Waiter
322	Bartender
323	Busboy
324	Hostess
325	Steward
326	Waiter
350	Chef
351	Chef

DUTY_ALLOCATION

Duty_no	Employee_No	Day	Shift
321	123456	20030419	1
322	123457	20030418	2
323	123458	20030418	1
321	123461	20030420	2
321	123461	20030419	2
350	123471	20030418	1
323	123458	20030420	3
351	123471	20030419	1

(a) What do the following SQL queries do ?   (4)

   (i) SELECT P1.Duty_NO, P2.Duty_NO
       FROM POSITION P1, POSITION P2
       WHERE
       P1.SKILL = P2.SKILL
       AND P1.Duty_NO < P2.Duty_NO

   (ii) SELECT NAME, PAY_RATE
        FROM EMPLOYEE
        WHERE
        EMPLOYEE_NO < 123460
        AND PAY_RATE > ANY
                (SELECT PAY_RATE
                FROM EMPLOYEE
                WHERE
                EMPLYEE_NO = 123460)

(b) Give an SQL query for the following :

    (i) List the names of employees who are assigned to all positions that require a chef's skill.

    (ii) List names and rate of pay of all employees who are not allocated a duty.   (4)

(c) Give a query in relational algebra for the following :

    (i) List names of employees who were on duty on the same day.

    (ii) List names and rate of pay of all employees who are allocated a duty.   (4)

5.   Consider the following relational schema

R (A, B, C, D, E, F, G, H, I, J, K)

R satisfies the following functional dependencies (and any other logically implied by these)

$I \rightarrow K$

$AI \rightarrow BFG$

$IC \rightarrow ADE$

$BIG \rightarrow CJ$

$K \rightarrow HA$

    (a) Find the Primary key and super key of this schema.   (3)

(b) Which normal form the relation R is in ? Convert R into a higher normal form. (3)

6. Consider the following relation R

Name	Department	Advisor
Jones	Computer Science	Smith
Ng	Chemistry	Turner
Martin	Physics	Bosky
Dullies	Decision Science	Hall
Duke	Mathematics	James
James	Computer Science	Clark
Evan	Computer Science	Smith
Baxter	English	Bronte

R is decomposed into two relations

R1 (Name, Department) and

R2 (Department, Advisor)

Does this decomposition lead to any loss of information ? Explain your answer. (4)