

This question paper contains 4 printed pages.

8068

Your Roll No.

B.Sc. (Gen.) / III

D

COMPUTER SCIENCE— Paper V

(Data Base Systems)

Time : 3 hours

Maximum Marks : 38

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

*Question No. 1 is compulsory. Attempt any two
questions from questions 2 to 4.*

1. (a) Distinguish between:

- (i) Primary key and foreign key
- (ii) Program-data independence and program-operation independence
- (iii) Database schema and database state. 3×2

(b) Let R(A, B) and S(B, C) be the two relations as shown below:

R	
A	B
a	b
c	b
d	e

S	
B	C
b	c
e	a
b	d

P.T.O.

Compute the following:

- | | |
|------------------------------|---|
| (i) $R \cup S$ | 1 |
| (ii) $S - R$ | 2 |
| (iii) $R * S$ (Natural Join) | 2 |

(c) Two sets of FDs for a relation $R(A, B, C, D, E)$ are given as follows:

$F = \{A \rightarrow B, AB \rightarrow C, D \rightarrow AC, D \rightarrow E\}$ and

$G = \{A \rightarrow BC, D \rightarrow AE\}$

Are F and G equivalent? Explain your answer. 3

2. (a) Describe the structural constraints specified on a relationship type. How are they represented in ER diagrams? Illustrate using a suitable example. 6
- (b) A bank offers three types of accounts: loan, current and savings. It operates a number of branches and a client of the bank can have multiple accounts. Accounts can be joint or single. Identify the entities of interest and show their attributes. What relationships exist among these entities? Draw the corresponding E-R diagram. 6
3. Consider the following relational database schema that keeps track of auto sales in a car dealership. (Relation

OPTION refers to some optional equipment installed on an auto):

CAR (Serial_no, Model, Manufacturer, Price)

OPTION (Serial_no, Option_name, Price)

SALES (Salesperson_id, Serial_no, Date, Sale_price)

SALESPERSON (Salesperson_id, Name, Phone)

Do the following:

- (a) Populate the relations with few example tuples, and show an example of an insertion in the SALES and SALESPERSON relations that violates the referential integrity constraints and another insertion that does not. 4
 - (b) Specify the following queries in relational algebra and SQL:
 - (i) For the salesperson named 'Jane Doe', list the Serial_no, Manufacturer, Sale_price for the cars she sold.
 - (ii) List the Serial_no and model of cars that have no options. 4×2=8
4. (a) For a relation R(A, B, C, D, E, F), the set of FDs Z is given as follows:
- $$Z = \{ AB \rightarrow C, C \rightarrow A, BC \rightarrow D, ACD \rightarrow B, BE \rightarrow C, CE \rightarrow FA, CF \rightarrow BD, D \rightarrow E \}$$

Which normal form is R in? Normalize it further till it cannot be decomposed. 8

- (b) What characteristics should an object identifier (OID) possess? Differentiate between transient and persistent objects. 4