B.E. (I.T.) 5th Semester Section A

Sessional I **Database Management System** **November 2020**

MM: 30 **Time: 90 minutes**

Note: Questions I to III are compulsory. There is a choice between questions IV and V.

Students have to scan and upload their answer booklets as per instructions for minors on Google Classroom for DBMS (htuko4a) within 15 minutes of finish of exam. In case you are unable to do so, please email the answer booklet at vmangat@pu.ac.in, strictly within 15 minutes of finish of exam.

I A database has to store information about patients in a hospital. On arrival, each patient's personal details (name, address, and telephone number) are recorded, and they are given an admission number. They are then assigned to a particular ward (Accident and Emergency, Cardiology, Oncology, etc.). In each ward there are a number of doctors and nurses. A patient will be treated by one doctor and several nurses over the course of their stay, and each doctor and nurse may be involved with several patients at any given time.

a) Draw an entity-relationship diagram modelling this scenario. Mark additional assumptions, constraints and cardinality ratios clearly. (6 marks)

b) Convert the ER diagram identified above into relational form. (4 marks)

II a) Given a relation $R\{A,B,C,D,E,F\}$ that satisfies the following FDs:

$AB \rightarrow C$

$C \rightarrow A$

$CF \rightarrow BD$

$D \rightarrow EF$

$BC \rightarrow D$

$ACD \rightarrow B$

$BE \rightarrow C$

$CE \rightarrow FA$

Find an irreducible equivalent for this set of FDs. (4 marks)

b) Consider the following scenario: A company has a set of departments. Each department has a set of employees, a set of projects, and a set of offices. Each employee has a job history (set of salaries received while employed on particular job). Each office has a set of phones.

The database should contain the following information:

- For each department: department number(unique), budget, department manager's employee number(unique)

- For each employee: employee number(unique), current project number, office number, phone number; title of each job the employee has held, plus date and salary for each distinct salary received in that job
- For each project: project number(unique) and budget
- For each office: office number(unique), floor area, and phone numbers(unique) for all phones in that office.

Design an appropriate set of relations to represent this information. State functional dependencies and assumptions, if any. Comment on the normal forms of each relation. (6 marks)

III Consider a two dimensional array of size *n* X *m* that is to be used in a programming language like C/C++. Using the array as an example, illustrate the difference between:

a) the different levels of data abstraction and (3 marks)

b) schema and instance (2 marks)

IV a) Define the term 'transaction'. Give any 2 examples of transaction processing applications. (2 marks)

b) Any weak entity set can be converted into strong entity set by adding appropriate attributes? Why then do we have weak entity sets? Explain with example. (3 marks)

OR

V Describe the function of the query processor and storage manager components of DBMS. (5 marks)