Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online End Semester Examination, December 2020

Course: Advanced Database Management Systems — **Semester: III**
Program: B. Tech. (CSE) — **Time : 03 hours**
Course Code: CSEG 2017 — **Max. Marks: 100**

SECTION A

1. Each Question will carry 5 Marks
2. Instruction: Complete the statement / Select the correct answer(s)

Q1	Given the following relation instance. **X Y Z** 1 4 2 1 5 3 1 6 3 3 2 2 Which of the following functional dependencies are satisfied by the instance? (A) XY -> Z and Z -> Y (B) YZ -> X and Y -> Z (C) YZ -> X and X -> Z (D) XZ -> Y and Y -> X	**CO4**
Q2	Database table by name Loan_Records is given below. **Borrower Bank_Manager Loan_Amount** Ramesh Sunderajan 10000.00 Suresh Ramgopal 5000.00 Mahesh Sunderajan 7000.00 What is the output of the following SQL query? SELECT Count(*) FROM ((SELECT Borrower, Bank_Manager FROM Loan_Records) AS S NATURAL JOIN (SELECT Bank_Manager, Loan_Amount FROM Loan_Records) AS T); (A) 3 (B) 9 (C) 5 (D) 6	**CO3**
Q3	Consider a relation scheme R = (A, B, C, D, E, H) on which the following functional dependencies hold: {A–>B, BC–> D, E–>C, D–>A}. What are the candidate keys of R? (A) AE, BE (B) AE, BE, DE (C) AEH, BEH, BCH (D) AEH, BEH, DEH	**CO4**

Q4	Consider the following log sequence of two transactions on a bank account, with initial balance 12000, that transfer 2000 to a mortgage payment and then apply a 5% interest. 1. T1 start 2. T1 B old=12000 new=10000 3. T1 M old=0 new=2000 4. T1 commit 5. T2 start 6. T2 B old=10000 new=10500 7. T2 commit Suppose the database system crashes just before log record 7 is written. When the system is restarted, which one statement is true of the recovery procedure? (A) We must redo log record 6 to set B to 10500 (B) We must undo log record 6 to set B to 10000 and then redo log records 2 and 3. (C) We need not redo log records 2 and 3 because transaction T1 has committed. (D) We can apply redo and undo operations in arbitrary order because they are idempotent	**CO5**
Q5	Consider a disk with block size B = 512 bytes. A block pointer is P = 6 bytes long, and a record pointer is PR = 7 bytes long. A file has r = 30,000 EMPLOYEE records of fixed length. Each record has the following fields: Name (30 bytes), Ssn (9 bytes), Department_code (9 bytes), Address (40 bytes), Phone (10 bytes), Birth_date (8 bytes), Sex (1 byte), Job_code (4 bytes), and Salary (4 bytes, real number).An additional byte is used as a deletion marker. Calculate the number of file blocks b assuming an unspanned organization. (A) 7,500 (B) 10,000 (C) 7,000 (D) 5,000	**CO2**
Q6	Consider the table employee(empId, name, department, salary) and the two queries Q1 ,Q2 below. Assuming that department 5 has more than one employee, and we want to find the employees who get higher salary than anyone in the department 5, which one of the statements is TRUE for any arbitrary employee table? **QUERY 1 :** Select e.empId From employee e Where not exists (Select * From employee s where s.department = “5” and s.salary >=e.salary) **QUERY 2 :** Select e.empId From employee e Where e.salary > Any (Select distinct salary From employee s Where s.department = “5”) (A) Q1 is the correct query (B) Q2 is the correct query (C) Both Q1 and Q2 produce the same answer. (D) Neither Q1 nor Q2 is the correct query	**CO3**
SECTION B **1. Each question will carry 10 marks** **2. Instruction: Write short / brief notes**		
Q7	Define Boyce-Codd normal form. How does it differ from 3NF? Why is it considered a stronger form of 3NF?	**CO4**

Q8	What is the two-phase locking protocol? How does it guarantee Serializability?	**CO5**
Q9	Suppose you are given the following requirements for a simple database for the National Hockey League (NHL): • NHL has many teams, • Each team has a name, a city, a coach, a captain, and a set of players, • Each player belongs to only one team, • Each player has a name, a position (such as left wing or goalie), a skill level, and a set of injury records, • A team captain is also a player, • A game is played between two teams (referred to as host_team and guest_team) and has a date (such as May 11th, 1999) and a score (such as 4 to 2). Construct a clean and concise ER diagram for the NHL. List your assumptions and clearly indicate the cardinality mappings as well as any role indicators in your ER diagram.	**CO1**
Q10	Explain ACID properties of transaction.	**CO5**
Q11	Write Relational Algebra queries for the following schema: Instructor (ID, name, dept_name, salary) Teaches (ID, course_id, sec_id, semester, year) Course (course_id, Title, Fee, credits) I. Find the names of all instructors together with the *course id* of all courses they taught. II. Find the names of all instructors in the Physics department together with the *course id* of all courses they taught. III. Find the highest salary in the university. IV. Find the names of all instructors in the Comp. Sci. department together with the course titles of all the courses that the instructors teach.	**CO1**
Section C **1. Each Question carries 20 Marks.** **2. Instruction: Write long answer.**		
Q12	What is distributed database management system? Explain the structure of distributed database. Discuss various types of data fragmentation schemes. **OR** Discuss different types of database models. Explain how Object Oriented Database Management System (OODBMS) is better than Relational Database Management System (RDBMS).	**CO6**