Punjab Engineering College (Deemed to be University)
Mid-Semester Examination

Programme: **B.Tech-CSE**
Course Name: **Database Management Systems**
Maximum Marks: **30**
SID:

Year/Semester: **2020/4th**
Course Code: **CSN208**
Time allowed: **90 mins**

Notes:

- **All questions are compulsory.** This question paper consists of **two pages.**
- Unless stated o herwise, the symbols have their usual meanings in context with subject. Assume suitably and state, additional data required, i any.
- The candidates, before starting to write the solutions, should please check the question paper for any discrepancy, and also ensure that they have been delivered the question paper of right course code.

Q. No.	Question	Marks
1.	Consider Dean Academic Affairs (DAA) office of PEC that maintains data about the following entities: (a) courses, including number, title, credits, syllabus, and prerequisites; (b) course offerings, including course number, year, semester, section number, instructor(s), timings, and classroom; (c) students, including student-id, name, and program; and (d) instructors, including identification number, name, department, and title. Further, the enrolment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modelled. Construct an E-R diagram for the DAA office. Document all assumptions that you make about the mapping constraints. Can we have a weak entity in the given scenario?	(8)
2.	Consider the following two tables C and D. What will be the output of following relational algebra query: C Num | Square 2 | 4 3 | 9 D Num | Cube 2 | 8 3 | 27 (i) C * D (ii) $\pi_{Num}C \cap \pi_{Num}D$ (iii) $\pi_{Num}C \cup \pi_{Num}D$	(6)
3.	In any relation there should be an attribute that can provide uniqueness. In such scenario how can you define a primary key and what are conditions that an attribute must satisfy to become a primary key?	(2)
4.	Consider a disk pack with a seek time of 4 milliseconds and rotational speed of 10000 rotations per minute (RPM). It has 600 sectors per track and each sector can store 512 bytes of data. Consider a file stored in the disk. The file contains 2000 sectors. Assume that every sector access necessitates a seek, and the average rotational latency for accessing each sector is half of the time for one complete rotation. Calculate the total time (in milliseconds) required to read the entire file.	(4)

5.	Consider a file of 16384 records. Each record is 32 bytes long and its key field is of size 6 bytes. The file is ordered on a non-key field, and the file organization is unspanned. The file is stored in a file system with block size 1024 bytes, and the size of a block pointer is 10 bytes. If the secondary index is built on the key field of the file, and a multi-level index scheme is used to store the secondary index, then (a) Find the number of first-level blocks in the multi-level index (b) Find the number of second-level blocks in the multi-level index	(5)
6.	A file has r = 20,000 STUDENT records of *fixed length*. Each record has the following fields: NAME (30 bytes), SSN (9 bytes), ADDRESS (40 bytes), PHONE (9 bytes), BIRTHDATE (8 bytes), SEX (1 byte), MAJORDEPTCODE (4 bytes), MINORDEPTCODE (4 bytes), CLASSCODE (4 bytes, integer), and DEGREEPROGRAM (3 bytes). An additional byte is used as a deletion marker. The file is stored on the disk and block size is 512 bytes. 1 Calculate the record size R in bytes. 2. Calculate the blocking factor *bfr* and the number of file blocks *b*, assuming an unspanned organization. 3. Calculate the average time it takes to find a record by doing a linear search on the file 4. Assume that the file is ordered by SSN; calculate the time it takes to search for a record given its SSN value, by doing a binary search. 5. If Index table entry is of 32 bytes then calculate the time it takes to search the record, both for dense and sparse indices.	(5)