Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

I SEMESTER M.TECH. (CSE/CSIS) END SEMESTER EXAMINATIONS, NOV/DEC 2018

SUBJECT: ADVANCED DATABASE SYSTEMS [CSE 5102]

REVISED CREDIT SYSTEM

(22/11/2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A. Explain prepared statements in JDBC code with an example. **2**

1B. Consider a relation *prereq* (*course_id*, *prereq_id*) given Table 1B below:

Table 1B

course_id	***prereq_id***
CS-201	CS-101
CS-301	CS-201
CS-347	CS-301

Write recursive query in SQL to find the courses that are directly or indirectly prerequisite for CS-347. **3**

1C. With usual notations write Merge-Join Algorithm to compute natural join of two relations r and s. **5**

2A. Consider the relational schema given below. Write the relational algebra expression to find names of all instructors in Music department together with the course title of all the courses that the instructors teach. Draw the initial query tree and transformed (optimized) query tree.

instructor(ID, name, dept_name, salary)
teaches(ID, course_id, sec_id, semester, year)
course(course_id, title, dept_name, credits)

3

2B. Explain unnesting. Consider *books* relation in Fig. 2B below:

title	*author_array*	*publisher*	*keyword_set*
		(*name, branch*)	
Compilers	[Smith, Jones]	(McGraw-Hill, NewYork)	{parsing, analysis}
Networks	[Jones, Frick]	(Oxford, London)	{Internet, Web}

Figure 2B

Consider the following SQL query:

```
select title, A.author, publisher.name as pub_name, publisher.branch
        as pub_branch, K.keyword
from books as B, unnest(B.author_array) as A(author),
        unnest (B.keyword_set) as K(keyword);
```

Show the new relation, which is the output of preceding query. **3**

2C. Explain with examples structured types and inheritance SQL. **4**

3A. With neat diagram explain parallel Fragment and Replicate Join algorithm to compute natural join of two relations r and s. **4**

3B. Explain number of advantages and disadvantages to replication of relation in distributed databases. **3**

3C. Compute the join of following four relations using join strategies that exploit parallelism

$$r_1 \bowtie r_2 \bowtie r_3 \bowtie r_4$$

Where relation r_i is stored at site S_i. **3**

4A. Draw the snowflake schema diagram for the sales data of a company with respect to the four dimensions, namely time, item, branch and location. Schema diagram must have appropriate key and attributes for each dimensions. **3**

4B. Distinguish between sub-elements and attributes in XML document. **2**

4C. Write the XML schema version for the following document type definition (DTD) for the university information system.

```
<!DOCTYPE university [
    <!ELEMENT university ( (department|course|instructor|teaches)+)>
    <!ELEMENT department ( dept_name, building, budget)>
    <!ELEMENT course ( course_id, title, dept_name, credits)>
    <!ELEMENT instructor (IID, name, dept_name, salary)>
    <!ELEMENT teaches (IID, course_id)>
    <!ELEMENT dept_name( #PCDATA )>
    <!ELEMENT building( #PCDATA )>
    <!ELEMENT budget( #PCDATA )>
    <!ELEMENT course_id ( #PCDATA )>
    <!ELEMENT title ( #PCDATA )>
    <!ELEMENT credits( #PCDATA )>
    <!ELEMENT IID( #PCDATA )>
    <!ELEMENT name( #PCDATA )>
    <!ELEMENT salary( #PCDATA )>
] >
```

5

5A. Define Map and Reduce functions. Write MapReduce algorithms to compute join of two relations R and S. **4**

5B. List various characteristics of SQL and NoSQL databases. **4**

5C. Briefly explain polyglot persistence. **2**