Reg No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
A Constituent Institution of Manipal University

I SEMESTER M.TECH. (COMPUTER SCIENCE AND ENGINEERING / COMPUTER SCIENCE AND INFORMATION SECURITY)
END SEMESTER EXAMINATIONS, FEB 2021
SUBJECT: ADVANCED DATABASE SYSTEMS [CSE 5153]

REVISED CREDIT SYSTEM
(24/02/2021)

TIME : 3 HOUR **MAX.MARKS : 50 M**

Instructions to the Candidates
- Answer all FIVE full Questions.
- Missing data can be suitably assumed.

1.A Write the requirements of an autonomous system and dimensions of autonomy. 3M

1.B Consider relation ASG in Figure 1. Suppose there are two applications that access ASG. The first is issued at five sites and attempts to find the duration of assignment of employees given their numbers. Assume that managers, consultants, engineers, and programmers are located at four different sites. The second application is issued at two sites where the employees with an assignment duration of less than 20 months are managed at one site, whereas those with longer duration are managed at a second site. Derive the primary horizontal fragmentation of ASG using the foregoing information. 4M

EMP

ENO	ENAME	TITLE
E1	J. Doe	Elect. Eng
E2	M. Smith	Syst. Anal.
E3	A. Lee	Mech. Eng.
E4	J. Miller	Programmer
E5	B. Casey	Syst. Anal.
E6	L. Chu	Elect. Eng.
E7	R. Davis	Mech. Eng.
E8	J. Jones	Syst. Anal.

ASG

ENO	PNO	RESP	DUR
E1	P1	Manager	12
E2	P1	Analyst	24
E2	P2	Analyst	6
E3	P3	Consultant	10
E3	P4	Engineer	48
E4	P2	Programmer	18
E5	P2	Manager	24
E6	P4	Manager	48
E7	P3	Engineer	36
E8	P3	Manager	40

PROJ

PNO	PNAME	BUDGET
P1	Instrumentation	150000
P2	Database Develop.	135000
P3	CAD/CAM	250000
P4	Maintenance	310000

PAY

TITLE	SAL
Elect. Eng.	40000
Syst. Anal.	34000
Mech. Eng.	27000
Programmer	24000

Figure 1

1.C Briefly discuss the Discretionary Access Control (DAC) along with an example? 3M

2.A Consider the following subset of the engineering database schema and write the query: " to find the names of employees who are managing a project".

EMP(ENO, ENAME, TITLE)
ASG(ENO, PNO, RESP, DUR)

Explain the importance of site selection and communication for a chosen relational algebra query $\Pi_{ENAME}\,(EMP \bowtie_{ENO} (\sigma_{RESP="Manager"}\,(ASG)))$ against a fragmented database. 4M

2.B Simplify the following query:

```
SELECT ENAME, PNAME
FROM EMP, ASG, PROJ
WHERE (DUR > 12 OR RESP = "Analyst")
AND EMP.ENO = ASG.ENO
AND (TITLE = "Elect. Eng." OR ASG.PNO < "P3")
AND (DUR > 12 OR RESP NOT= "Analyst")
AND ASG.PNO = PROJ.PNO
```

	and transform it into an optimized operator tree using the restructuring algorithm where select and project operations are applied as soon as possible to reduce the size of intermediate relations.	4M
2.C	'*The search space is the set of alternative execution plans that represent the input query*'. Justify your answer.	2M
3.A	What is Transaction? Describe the Properties of Transactions.	4M
3.B	Describe the Communication Structure of Centralized 2PL.	3M
3.C	'*Deadlock avoidance methods are more suitable than prevention schemes for database environments*'. Justify the your answer.	3M
4.A	With neat sketch, discuss the interface between the Local Recovery Manager and the Buffer Manager.	4M
4.B	Compare Mutual Consistency with Transaction Consistency with an example.	4M
4.C	What is NoSQL? Write the common characteristics of NoSQL.	2M
5.A	What is an aggregate? Explain the importance of an aggregate in NoSQL, with an example.	3M
5.B	i. '*Sharding puts different data on separate nodes, each of which does its own reads and writes*'. Justify your answer.	
	ii. What is auto sharding? Explain.	3M
5.C	Write a short note on: Concurrency approaches, Inconsistency window, Trading off consistency, and Forgo transactions.	4M

-ALL THE BEST-