NSS COLLEGE OF ENGINEERING, PALAKKAD
FOURTH SEMESTER B.TECH DEGREE
SECOND INTERNAL EXAMINATION JUNE 2023.
Department of Computer Science & Engineering
CST 204 Database Management Systems

(Answer all five questions.)

Modules 4 to 6: Part 'a' of each question is compulsory and it carries 3 marks.

Answer either part 'b' or part 'c' of each question, which carries 7 marks each.

Time: 2:00 Hour **Maximum Marks: 50**

Q.no.	MODULE 3	Marks
1. a	For the database table given below, which will be a suitable indexing scheme to be selected if indexing is to be done using SID? Justify	3

SID	Activity	Fee	Instructor
100	Basket Ball	200	Lebron
100	Golf	65	Arnold
200	Golf	65	Jack
300	Golf	65	Lebron

	Answer b or c	
b	Consider a disk with block size B=1024 bytes. A block pointer is P=6 bytes long, and a record pointer is Pr =7 bytes long. A file has r=50,000 EMPLOYEE records of fixed-length. Each record has the following fields: NAME (30 bytes), SSN (9bytes), DEPARTMENTCODE(9 bytes), ADDRESS (40 bytes), PHONE (9 bytes), BIRTHDATE (8 bytes), SEX (1 byte), JOBCODE (4 bytes) and SALARY (4 bytes). (a) Calculate the blocking factor bfr and the number of file blocks b assuming an unspanned organization. (2) (b) Suppose that the file is *ordered* by the key field SSN and we want to construct a *primary* index on SSN. Calculate (5) (i) the index blocking factor (ii) the number of first-level index entries and the number of first-level index blocks (iii) the number of levels needed if we make it into a multi-level index (iv) the total number of blocks required by the multi-level index (v) the number of block accesses needed to search for and retrieve a record from the file given its SSN value using the primary index.	**7**

c	Consider a disk with block size B=1024 bytes. A block pointer is P=6 bytes long, and a record pointer is Pr =7 bytes long. A file has r=60,000 EMPLOYEE records of fixed-length. Each record has the following fields: NAME (30 bytes), DEPARTMENTCODE (9 bytes), ADDRESS (40 bytes), PHONE (9 bytes), BIRTHDATE (8 bytes), SEX (1 byte), JOBCODE (4 bytes), and SALARY (4 bytes). Suppose that the file is *not ordered* and we want to construct an index on key field NAME. Which will be suitable indexing method to follow. Show the improvement in disk block access by comparing the performance of search with index and without index.	**7**

Q.no.	**MODULE 4**	**Marks**
2.a	Let R = (A, B, C, D, E, F) be a relation scheme with the following dependencies- C → F E → A EC → D A → B Which attribute (or attribute combination) is a key for R? Justify	**3**
	Answer b or c	
b	Consider the following relation i) Identify the functional dependencies from the above given data (2) ii) Normalize the table upto BCNF by following the normal forms (5)	**7**

SID	CID	S_name	C_name	Grade	Faculty	F_phone
1	IS318	Adams	Database	A	Howser	60192
1	IS301	Adams	Program	B	Langley	45869
2	IS318	Jones	Database	A	Howser	60192
3	IS318	Smith	Database	B	Howser	60192
4	IS301	Baker	Program	A	Langley	45869
4	IS318	Baker	Database	B	Howser	60192

c	Given a relation R(A1,A2,A3,A4,A5) with functional dependencies A1→A2A4 and A4→A5, check if the decomposition R1(A1,A2,A3), R2(A1,A4), R3(A2,A4,A5) is lossless.	**7**

Q.no.	**MODULE 4**	**Marks**
3.a	Identify transitive dependency if any exist between two attributes in the relation given below **SID** | **Building** | **Fee** | **Manager** 100 | Fenn | 300 | Mr. T 300 | ΔΠ | 400 | Ali 200 | Holiday Inn | 400 | Tyson	3
	Answer b or c	
b	Consider the following relation **TEACH** Student | Course | Instructor Narayan | Database | Mark Smith | Database | Navathe Smith | Operating Systems | Ammar Smith | Theory | Schulman Wallace | Database | Mark Wallace | Operating Systems | Ahamad Wong | Database | Omiecinski Zelaya | Database | Navathe Narayan | Operating Systems | Ammar i) Identify the functional dependencies from the above given data (2) ii) Normalize the table upto BCNF by following the normal forms (5)	**7**

c	A relation R (A , C , D , E , H) is having two functional dependencies sets F and G as F = { A → C, AC → D, E → AD, E → H} and G = {A → CD, E → AH }. Check the equivalence of F and G	**7**

Q.no.	**MODULE 5**	**Marks**
4.a	Explain the lost update problem in concurrent transaction processing	3
	Answer b or c	
b	Consider the following two transactions and schedule (time goes from top to bottom). Is this schedule conflict-serializable? Explain why or why not.	**7**
c	Justify whether the schedules S1 and S2 given below are recoverable or not S1: R1(x), W1(x), R2(x), R1(y), R2(y), W2(x), W1(y), C1, C2; S2: R1(x), R2(x), R1(z), R3(x), R3(y), W1(x), W3(y), R2(y), W2(z), W2(y), C1, C2, C3;	**7**

Transaction T_0	Transaction T_1
$r_0[A]$	
$w_0[A]$	
	$r_1[A]$
	$r_1[B]$
	c_1
$r_0[B]$	
$w_0[B]$	
c_0	

Q.no.	**MODULE 5**	**Marks**
5.a	Explain any three scenarios that need NoSQL stores for data management	3
	Answer b or c	
b	Briefly explain the CAP theorem of distributed databases along properties of NoSQL databases that satisfy CAP theorem.	**7**
c	Briefly explain the four major types of NoSQL databases	**7**