Sample Question Format
(For all courses having end semester Full Mark=50)

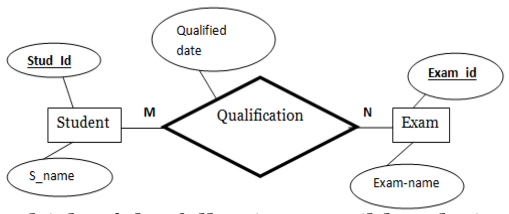
KIIT Deemed to be University
Online End Semester Examination(Spring Semester-2022)

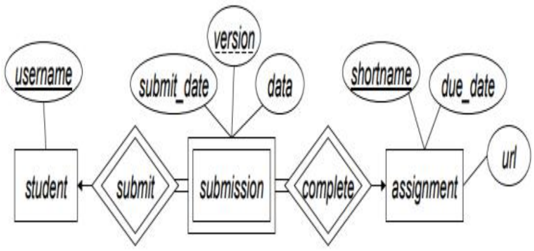
Subject Name & Code: DBMS (CS-2004) **Applicable to Courses:** B. Tech (CSE, IT, CSSE, ECS)

Full Marks=50 **Time:2 Hours**

SECTION-A(Answer All Questions. Each question carries 2 Marks)

Time:30 Minutes **(7×2=14 Marks)**

Question No	Question Type (MCQ/SAT)	Question	CO Mapping	Answer Key (For MCQ Questions only)
Q.No:1	**SAT**	What are the disadvantages of hierarchical data model?	CO1	
	SAT	What are the disadvantages of network data model?	CO1	
	SAT	What are the advantages of relational data model?	CO1	
	SAT	What are the advantages of Entity-Relationship data model?	CO1	
Q.No:2	**MCQ**	Consider the following ER diagram  Which of the following possible relations will not hold if the above ER diagram is mapped into relational data model? A. Student(stud_id,S_name) B. Qualification(stud_id,Exam_id,Qualified date) C. Exam(Exam_id,Exam_name,Stud_id) D. Exam(Exam_id,Exam-name)	CO2	C
	MCQ	Let E1 and E2 are two strong entity sets in ER diagram.E1 contains mobile no as multivalued attribute where as all the attributes defined for E2 are simple single valued attribute.If T1 and T2 are	CO2	B

		two relations betweenE1 and E2 where T1 is one-to –many and T2 is many-to-many relationship set.Find the minimum number of tables required to represent E1,E2,T1 and T2 in the relational model? A. 3 B. 4 C. 5 D. 6		
	MCQ	Suppose that there are two entity sets E1 and E2 with attributes a1, a2, a3 and b1, b2, b3 respectively. Here, a1 is the key for A and b2 is the key for B. If there exists a many-to-many relationship R from E1 to E2 with an attribute r1, what would be the schema for R after converting the ER diagram into schemas? A. R(a1,b1,a2,b2,a3,b3) B. R(a1,b1,r1) C. R(a1,b2,r1) D. R(a1,b1,r1,r2)	CO2	C
	MCQ	What are the relational schemas that we get when we reduce The Entity Relationship Diagram given below?  A. Student(username) Assignment(shortname ,due_date,url) Submission(version,submit_date, data) B. Student(username) Assignment(shortname,due_date,url) Submission(username,shortname,version,submit_date,data) C. Student(username) Assignment(shortname,username,due_date,url) Submission(username,shortname,version,submit_date,data) D. Student(username,shortname) Assignment(shortname,username,due_date,url) Submission(username,shortname,version,submit_date,data)	CO2	B
Q.No:3	**MCQ**	Consider the following relation schema Student (roll, name, mob, cgpa, city, age)	CO3	B

		Faculty (fid, fname, doj, salary, specialization) Teach (fid, roll, semester) Domain (specialization, subject) Which of the following Tuple relational calculus expression will find the faculty names who are teaching to the student who belongs to city BBSR and teaching DBMS subject? A. $\{T \mid \forall S \in student, \exists F \in Faculty, \exists T1 \in Teach, \exists D \in Domain(s.roll=T1.roll \land T1.fid=f.fid \land f.specialization=D.specialization \land s.city=\text{"BBSR"} \land D.subject=\text{"DBMS"} \land T.fname=f.fname)\}$ B. $\{T \mid \exists S \in student, \exists F \in Faculty, \exists T1 \in Teach, \exists D \in Domain(s.roll=T1.roll \land T1.fid=f.fid \land f.specialization=D.specialization \land s.city=\text{"BBSR"} \land D.subject=\text{"DBMS"} \land T.fname=f.fname)\}$ C. $\{T \mid \forall S \in student, \forall F \in Faculty, \exists T1 \in Teach, \exists D \in Domain(s.roll=T1.roll \land T1.fid=f.fid \land f.specialization=D.specialization \land s.city=\text{"BBSR"} \land D.subject=\text{"DBMS"} \land T.fname=f.fname)\}$ D. $\{T \mid \exists S \in student, \forall F \in Faculty, \exists T1 \in Teach, \exists D \in Domain(s.roll=T1.roll \land T1.fid=f.fid \land f.specialization=D.specialization \land s.city=\text{"BBSR"} \land D.subject=\text{"DBMS"})\}$		
	MCQ	Consider the following relational schemas SUPPLIER(sid,sname,address) PART(pid,pnamecolor) CATALOG(sid,pid,cost) Which of the following query will find the name of suppliers who supply parts whose catlog cost is more than 2000? A. $\prod_{sname}(\sigma_{cost>2000}(SUPPLIER \bowtie PART \bowtie CATALOG)$ B. $\prod_{all}(\sigma_{cost>2000}(SUPPLIER \bowtie PART \bowtie CATALOG)$ C. $\prod_{sid,sname,address}(\sigma_{cost>2000}(PART \bowtie CATALOG)$ D. $\prod_{sname}(\sigma_{cost>2000}(SUPPLIER \bowtie CATALOG)$	CO3	D
	MCQ	Consider the following relational database schema consisting of the four relation schemas: **passenger** (pid, pname, pgender, pcity) **agency** (aid, aname, acity)	CO3	C

		flight (fid, fdate, time, src, dest) **booking** (pid, aid, fid, fdate) $\prod_{aname}(agency \bowtie_{acity=pcity}(\sigma_{pid=234}(passenger)))$ The relational algebra expression will result in finding_____________. A. The details of the agencies that located in the same city as passenger with passenger id 234. B. All passenger with passenger id 234 and their located city names C. The agency name for agencies that located in the same city as passenger with passenger id 234 D. The agencies name who have same city names		
	MCQ	An expression in the domain relational calculus is of the form A. {P(x1, x2, . . . , xn) | < x1, x2, . . . , xn > } B. {x1, x2, . . . , xn | < x1, x2, . . . , xn > } C. { x1, x2, . . . , xn | x1, x2, . . . , xn} D. {< x1, x2, . . . , xn > | P(x1, x2, . . . , xn)}	CO3	D
Q.No:4	**MCQ**	Let R = (A, B, C, D) be a relations schema with A, B, C, D are the candidate keys. The number of super keys formed are: **A. 4** **B. 7** **C. 15** **D. 16**	CO4	C
	MCQ	Let R = (A, B, C, D, E) be a relation schema with {AB} is the only candidate keys. The maximum number of super keys formed are: **A. 3** **B. 4** **C. 5** **D. 8**	CO4	D
	MCQ	Consider the following set of functional dependencies, F = {A→B, A→C, A→D, B→C, B→E, C→E} defined on a relation schema R (A, B, C, D, E). Which of the following is the set of redundant functional dependencies? A. A→B & A→C B. A→C & B→E C. A→B & B→C D. B→C & C→E	CO4	B
	MCQ	Let R(A,B,C,D,E) be a relation schema with set of functional dependencies, F = {AB→CDE, B→D, C→E}.	CO4	B

		The relation R is decomposed into R1(B,D), R2(C,E) and R3(ABC). Which of the following is true for the above problem description? I. R is in 1NF. II. The decomposition is lossless join and dependency preserving decomposition. III. The decomposition is lossless join and but not a dependency preserving decomposition. IV. R1, R2, R3 are in BCNF A. Only I is true B. Both I & II are true C. Both I & III are true D. Only IV is true		
Q.No:5	**MCQ**	Which of the following is not a superkey in a relational schema with attributes A, B, C, D, E and primary key AD? A. ACDE B. ABCD C. ABCE D. ABCDE	CO4	C
	MCQ	Let R(A, B, C, D, E,F)be a relation schema with functional dependencies C→F, E→A, EC→D, A→B. Which of the following is a key of R? A. AC B. AE C. CD D. EC	CO4	D
	MCQ	Let R (E, F, G, H, I, J, K, L, M, N) and set of functional dependencies {EF→G, F→IJ, EH→KL, K→M, L→N} on R. What is the key for R? A. E B. EF C. EFH D. EFHKL	CO4	C
	MCQ	Let FD {AB→CD, AF→D, DE→F, C→G, F→E, G→A}. Which of the following is FALSE? A. $\{AB\}^+ = \{ABCDE\}$ B. $\{AF\}^+ = \{ACDEFG\}$ C. $\{CF\}^+ = \{ACDEFG\}$ D. $\{BG\}^+ = \{ABCDG\}$	CO4	B
Q.No:6	**MCQ**	In a database system, unique time stamps are assigned to each transaction. Let TS(T1) and TS(T2) be the time stamps of transactions T1 and T2 respectively. Besides, T1 holds a lock on the resource R	CO5	A

		and T2 has requested a conflicting lock on the same resource R. The following algorithm is used to prevent deadlocks in the database system assuming that a killed transaction is restarted with the same timestamp. If TS(T2)<TS(T1) then T1 is killed else T2 waits Assume any transactions that is not killed terminates eventually. Which of the following is TRUE about the database system that uses the above algorithm to prevent deadlocks? **A.** The database system is both deadlock-free and starvation-free **B.** The database system is deadlock-free, but not starvation-free **C.** The database system is starvation-free, but not deadlock-free D. The database system is neither deadlock-free nor starvation-free		
	MCQ	Which of the following scenarios may lead to an irrecoverable error in a database system? A. A transaction writes a data item after it is read by an uncommitted transaction B. A transaction reads a data item after it is read by an uncommitted transaction C. A transaction reads a data item after it is written by a committed transaction D. A transaction reads a data item after it is written by an uncommitted transaction	CO5	D
	MCQ	Which of the following concurrency control protocols ensure both conflict serializability and freedom from deadlock? I. 2-phase locking II. Time-stamp ordering A. I only B. II only C. Both I and II D. Neither I nor II	CO5	B
	MCQ	'Failures may leave database in an inconsistent state with partial updates carried out' is the case of A. Integrity problem B. Atomicity problem C. Security problem D. Data Redundancy & Inconsistency	CO5	B
Q.No:7	**MCQ**	An index is clustered, if	CO6	C

		A. It is on a set of fields that form a candidate key B. It is on a set of fields that include the primary key C. The data records of the file are organized in the same order as the data entries of the index D. The data records of the file are organized not in the same order as the data entries of the index		
	MCQ	A clustering index is defined on the fields which are of type A. key and ordering B. key and non-ordering C. non-key and ordering D. non-key and non-ordering	CO6	C
	MCQ	The physical location of a record determined by a formula that transforms a file key into a record location is A. Hashed file B. B tree file C. Indexed file D. Sequential file	CO6	A
	MCQ	In the indexed scheme of blocks to a file, the maximum possible size of the file depends on: A. Size of block B. Size of index C. Size of blocks and size of address D. The number of blocks used for index and the size of index	CO6	D

SECTION-B(Answer Any Three Questions. Each Question carries 12 Marks)

Time: 1 Hour and 30 Minutes **(3×12=36 Marks)**

Question No	Question	CO Mapping (Each question should be from the same CO(s))
Q.No:8	Draw the entity-relationship diagram for the hospital database as given below: The database maintains the	CO2

	details of doctors (identified by unique docid along with docname(composed to first name,middle name and last name), desgn and specialization) who are enrolled to departments; one doctor can enrol to one department only. Employees (identified by unique empid along with empname and mobno as multivalued attribute) are working in the departments; one employee can work in a single department only. Each department is identified through unique deptno along with deptname and location. There is a registration process required for all patients to a department before they treated by any doctor. Patient details must contain unique pid, pname, address (can be decomposed to street, city and pin), age and contactno. Employees are managing the patients. One patient can be treated by multiple doctors; also one doctor can treat multiple patients. Make necessary assumptions. Specify primary and foreign keys while converting the E/R diagram into relational schema.	
	Draw an ER diagram about Real Estate Builder database: • There are many builders available. Each builder has one unique bid along with bname, city and contact(s) as attributes. • Different customers (having unique cid along with cname, contact and address (can be decomposed to street, city, pin) as attributes. • Each builder offers different projects. • One customer may avail projects of different builders. • Each project can be categorized as either Plot or Apartment, but not both. Each plot has unique plid along with size, location and price as attributes. Similarly, each apartment has unique apid along with no_of_flats, location and price as attributes. Make necessary assumptions. Identify the primary and foreign keys. Then convert the above ER diagram into relational schemas.	
	Draw an ER diagram about a university database: • Professors have an SSN, a name, an age, a rank, and a research specialty. • Projects have a project number, a sponsor name, a starting date, an ending date, and a budget. • Graduate students have an SSN, a name, an	

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<td>age, and a degree program.

Each project is managed by one professor.
Each project is worked on by one or more professors.
Professors can manage and/or work on multiple projects.
Each project is worked on by one or more graduate students.
When graduate students work on a project, a professor must supervise their work on the project. Graduate students can work on multiple projects, in which case they will have a supervisor for each one.
Departments have a department number, a department name, and a main office.
Departments have a professor who runs the department.
Professors work in one or more departments, and for each department that they work in, a time percentage is associated with their job.
Graduate students have one major department in which they are working on their degree.
Each graduate student has another, more senior graduate student (known as a student advisor) who advises him or her on what courses to take.

Make necessary assumptions. Identify the primary and foreign keys. Then convert the above ER diagram into relational schemas.</td>
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<td><u>Q.No:9</u></td>
<td>Movie (<u>moviename</u>, makedate)
Star (<u>starname</u>, age)
Studio (<u>studioname</u>, city)
Produce (<u>studioname</u>, <u>moviename</u>)
Act (<u>starname</u>, <u>moviename</u>)
Solve the following queries using the relational algebra:
<ol type="a">
Find the star details who appeared in ‘ABC’ movie.
Find the stars who appeared in the movies made in 2000.
Find the star names who appeared in movies produced by studios located at ‘Bhubaneswar’.
Find the studionames where ‘ABC’ movie was made.
Find the stars who appeared in all movies made in 2000.
Find the stars’ details who are of minimum 30 years and appeared in ‘ABC’ movie.

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Movie (<u>moviename</u>, makedate)</td>
<td>CO3</td>
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	Star (starname, age) Studio (studioname, city) Produce (studioname, moviename) Act (starname, moviename) Solve the following queries using the SQL: a. Find the star details who appeared in 'ABC' movie. b. Find the stars who appeared in the movies made in 2000. c. Find the star names who appeared in movies produced by studios located at 'Bhubaneswar'. d. Find the studionames where 'ABC' movie was made. e. Find the stars who appeared in all movies made in 2000. f. Find the stars' details who are of minimum 30 years and appeared in 'ABC' movie.	
	Movie (moviename, makedate) Star (starname, age) Studio (studioname, city) Produce (studioname, moviename) Act (starname, moviename) Solve the following queries using the relational calculus: a. Find the star details who appeared in 'ABC' movie. b. Find the stars who appeared in the movies made in 2000. c. Find the star names who appeared in movies produced by studios located at 'Bhubaneswar'. d. Find the studionames where 'ABC' movie was made. e. Find the stars who appeared in all movies made in 2000. f. Find the stars' details who are of minimum 30 years and appeared in 'ABC' movie.	
Q.No:10	Suppose you are given a relation R(A,B,C,D,E) with the following functional dependencies: {CE→D, D→B, C→A}. a. Find all candidate keys b. Identify the best normal form that R satisfies. c. If the relation is not in BCNF, decompose it until it becomes BCNF.	CO4
	Suppose you are given a relation R(A, B, C, D, E) with the following functional dependencies: BD→E, A→C. a. Show that the decomposition into R1(A,B,C) and R2(D,E) is lossy. b. Find a single dependency from a single attribute X to another attribute Y such that when you add the dependency X→Y to the above dependencies, the decomposition in	

	part a is no longer lossy.	
	Let S(A,B,C,D,E) be a relation with FDs {A→BC, B→E, E→DA}. a. List all candidate keys for S. b. Is S is in 3NF? Justify your answer. c. Is S is in BCNF? Justify your answer.	
Q.No:11	Suppose we have an ordered data file with r = 50000 records stored on a disk with block size B = 1024 bytes. File records are of fixed size with record length, R = 256 bytes. One primary index file of the given data file is created based on ordering key field of the file. Assume that, the length of each index entry is 16 bytes (key field size= 8 bytes and a block pointer size = 8 bytes). Calculate the following: a) Blocking factor of data file and index file. b) Total number of blocks required for data file and index file. c) Number of block access on data file for a binary search.	CO6
	Suppose we have a data file with r = 50000 records stored on a disk with block size B = 1024 bytes. File record are of fixed size with record length, R = 256 bytes. One secondary index file is created on the file. Assume that, the length of each index entry is 16 bytes (key field size= 8 bytes and a block pointer size = 8 bytes). Calculate the following: a) Blocking factor of data file and index file. b) Total number of blocks required for data file and index file. c) Number of block access on data file for a binary search.	
	Suppose we have a data file with r = 50000 records stored on a disk with block size B = 1024 bytes. File record are of fixed size with record length, R = 256 bytes. One multilevel index file is created on the file. Assume that, the length of each index entry is 16 bytes (key field size= 8 bytes and a block pointer size = 8 bytes). Calculate the following: a) Blocking factor of data file and index file. b) Total number of blocks required for data file and index file. c) Number of block access on data file for a binary search.	