Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FOURTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: CS208

Course Name: PRINCIPLES OF DATABASE DESIGN (CS, IT)

Max. Marks: 100 Duration: 3 Hours

Limit answers to the required points.

PART A

Answer all questions, each carries 3 marks. Marks

1 List out any *three* responsibilities of database administrators. (3)

2 Give *good* examples (using ER notation) for unary and ternary relationships with a *very brief* explanation. (3)

3 Consider a scenario where artists act in movies: an artist can act in *different* movies and movie can have *many*artists. Assuming suitable attributes show how the situation can be represented using relations with foreign keys. (A relational schema showing primary and foreign keys is sufficient. Minimal number of attributes is required.) (3)

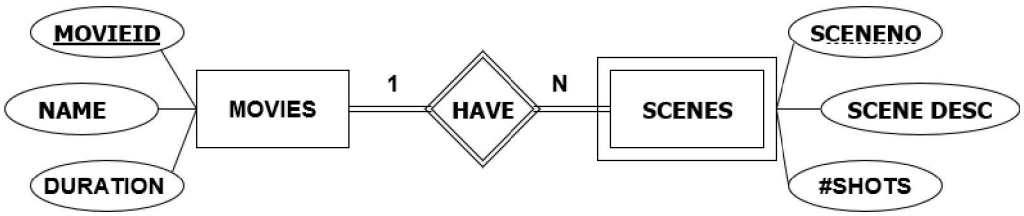
4 Two *relational algebra* expressions are said to be *equivalent* if they produce exactly the same output. Consider a relation R(A,B,C,D,E) with A as its key. (3)
(i) What can you say about the number of tuples returned by the expression $\Pi_{A,C}(R)$?
(ii) Write *two* relational algebra expressions *equivalent* to $\Pi_{A<20}(\Pi_{D>30}(R))$.

PART B

Answer any two full questions, each carries 9 marks.

5 a) Briefly explain the concepts of *physical data independence* and *logical data independence* with a typical real-world example for each. (5)

b) In the following ER diagram, howcan we replace the entity set SCENE with an attribute of the entity set MOVIE? Draw the new ER diagram. (4)



6 The relational database schema below represents certain information about albums, songs in the albums and singers of those songs. Foreign keys are given the *same* name as primary keys for easy identification. (9)

ALBUMS(ALBUM#, ALBUM-NAME, PRODUCED-BY, YEAR)
SONGS(SONG#, SONG-START, DURATION, ALBUM#)
SUNGBY(ARITISTNAME, SONG#)

In the context of the schema, write relational algebra expressions for the following queries:

(a) Names of albums produced by 'HMV' in the year 2018. (b) Names of albums in which an artist with name, 'AVANTHIKA' sung. (c) Names of albumsin which

all the artists have sung songs.

7 a) Use the standard synthesis procedure to generate the set of relations corresponding to the ER diagram below. Identify primary and foreign keys of the relations (4)

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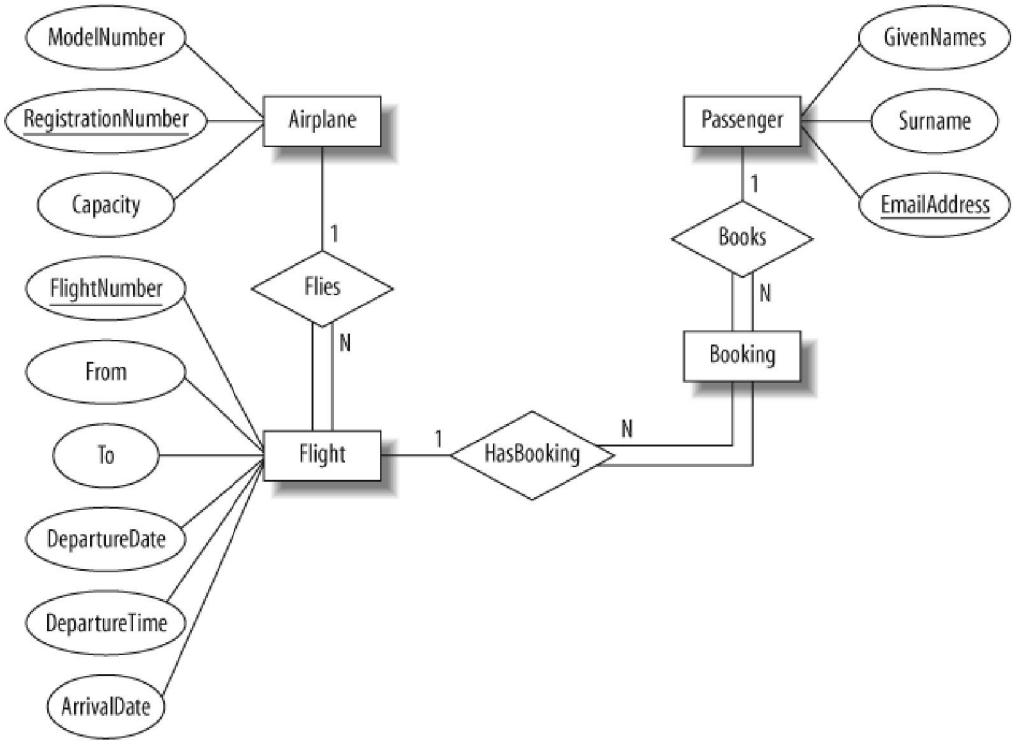

b) In the relational schema for a library given below, foreign keys have the same name as primary keys. Draw an ER diagram for the schema, clearly marking keys and cardinality constraints. (5)

BOOKS(ACC-NO, TITLE, EDITION, YEAR)
MEMBERS(MEMBERID, MEMBERNAME, MEMBERTYPE)
ISSUEDTO(ACC-NO,MEMBERID, DATEOFISSUE)

PART C

Answer all questions, each carries 3 marks.

8 Illustrate DELETE and UPDATE clauses using typical examples. (3)

9 Given two tables STUDENT(ROLLNO,NAME,CLASS) and ENROLLMENT(ROLLNO,COURSENAME) where ROLLNO in ENROLLMENT refers to STUDENT, what does the following SQL statement return? (3)

SELECT COURSENAME FROM ENROLLMENT WHERE ROLLNO = ALL (SELECT ROLLNO FROM STUDENT)

10 Define super key and minimal super key and illustrate using good examples. (3)

11 Given a relation R(A,B,C,D,E,F) with functional dependencies A→B, B→D, D→EF, F→A, compute {D}+ and {EF}+. (3)

PART D

Answer any two full questions, each carries 9 marks.

12 Consider the following relations: (9)

FACULTY(FNO, NAME, GENDER, AGE, SALARY, DNUM)
DEPARTMENT(DNO, DNAME, DPHONE)
COURSE(CNO, CNAME, CREDITS, ODNO)
TEACHING(FNO, CNO, SEMESTER)

DNUM is a foreign key that identifies the department to which a faculty belongs. ODNO is a foreign key identifying the department that offers a course.Write SQL expressions for the following queries:
(a) Names and department names of faculty members. (b) Names of faculty members not offering any course. (c) Names of departments offering more than three courses, in alphabetic order.

13 Given a relation R(A,B,C,D,E,F,G, H) with keys BD and C and functional dependencies D→G, E→F and H→C, decompose the R into the highest normal form possible. (9)

14 a) For the relations listed below, write SQL statements to create the database schema. Assume suitable data types. (5)
ALBUMS(ALBUM#, ALBUM-NAME, PRODUCED-BY, YEAR)
SONGS(SONG#, SONG-START, DURATION, ALBUM#)
SUNGBY(ARITISTNAME, SONG#)

b) Why the following is table,TRAININFO, not in INF? How can we make it 1NF? (4)

Route No	Rout Name	Distance	Trains	
			Train No	Name
5	MAS-TVC	179	12475	AP Express
			13457	Tvm Mail
9	TVC-DELHI	2781	16345	ND Express
			12461	Kerala Express
			16277	NZM Mail

PART E

Answer any four full questions, each carries 10 marks.

15 a) Define the following: (i) physical record (ii) logical record (iii) blocking factor. (3)

b) There are 12000 records in a data file. Each record in the file is of 75 bytes. Compute the number of block accesses if (i) Single level secondary index is available on a field of size 15 bytes. (ii) Multilevel index is available on the same field. (7)
Assume that the block size is 394 bytes, that un-spanned organization is used and that block and record pointers are 5 and 7 bytes, respectively.

16 a) How is *clustering index* different from *primary index*? (3)

b) Illustrate structure of B-Tree and B+-Tree and explain how they are different. (5)

c) Give a*non-canonical query tree* for the expression $\Pi_{A,B}(\sigma_{D<20}(R*S))$ on the relations R(A,B,C,D) and S (D,E). (2)

17 a) Consider the following tables representing enrolment of students to courses: STUDENT (ROLLNO, NAME, AGE, ADDRESS, EMAIL), COURSE(CNO, CNAME, AREA) and ENROLEMENT(ROLLNO, CNO,GRADE), where ROLLNO and CNO in ENROLMENT are foreign keys referring to the primary keys with the same names. (10)

Show an initial query tree for the following query and optimize it using the rules of heuristics. Assume that CNAME is a candidate key of COURSE.

SELECT CNAME, NAME, EMAIL, GRADEFROM STUDENT, COURSE, ENROLMENTWHERE COURSE.CNO=ENROLMENT.CNO AND STUDENT.ROLLNO = ENROLLMENT.ROLLNO AND COURSE.CNAME = 'dbs'

18 a) Check if the following schedules are conflict-serializable using precedence graph. If so, give the equivalent serial schedule(s). *r3(X), r2(X), w3(X), r1(X), w1(X).* (4)
(Note: ri(X)/wi(X) means transaction Ti issues read/write on item X.)

b) Discuss *dirty-read* and *lost-update* problems with the help of examples. (6)

19 a) How is *strict two-phaselocking* different from *standard two-phase locking* protocol? (2)

b) With the help of suitable logs, show how recovery is done in *deferred database modification scheme.* (5)

c) What is the significance of *check-pointing*? (3)

20 a) Give a simple RDF document and show the corresponding graph structure. (3)

b) Write an explanatory note on Big Data. (4)

c) Highlight any *three* salient features of GIS. (3)

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