



MACHAKOS UNIVERSITY

University Examinations for 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

SECOND/THIRD YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE (MATHEMATICS AND COMPUTER SCIENCE)

BACHELOR OF (STATISTICS AND PROGRAMMING)

BACHELOR OF SCIENCE (COMPUTER SCIENCE)

SCO 206/SST203/SMA392: DATABASE SYSTEMS

DATE: 22/7/2019

TIME: 11.00-1.00 PM

INSTRUCTIONS

Answer question **ONE** and **Any** other **Two** questions

QUESTION ONE (COMPULSORY)

- a) Give FOUR main characteristics of the database approach. (4 marks)
- b) List FOUR properties of a transaction. (4 marks)
- c) Differentiate between specialization and generalization. Give examples for each. (4 marks)
- d) Differentiate between the casual and the naïve end users of a database. (4 marks)
- e) List the three purposes of concurrency control. (3 marks)
- f) Explain three types of database failure. (3 marks)
- g) Explain the TWO types of database security mechanisms. (4 marks)
- h) List FOUR purposes of data warehousing. (4 marks)

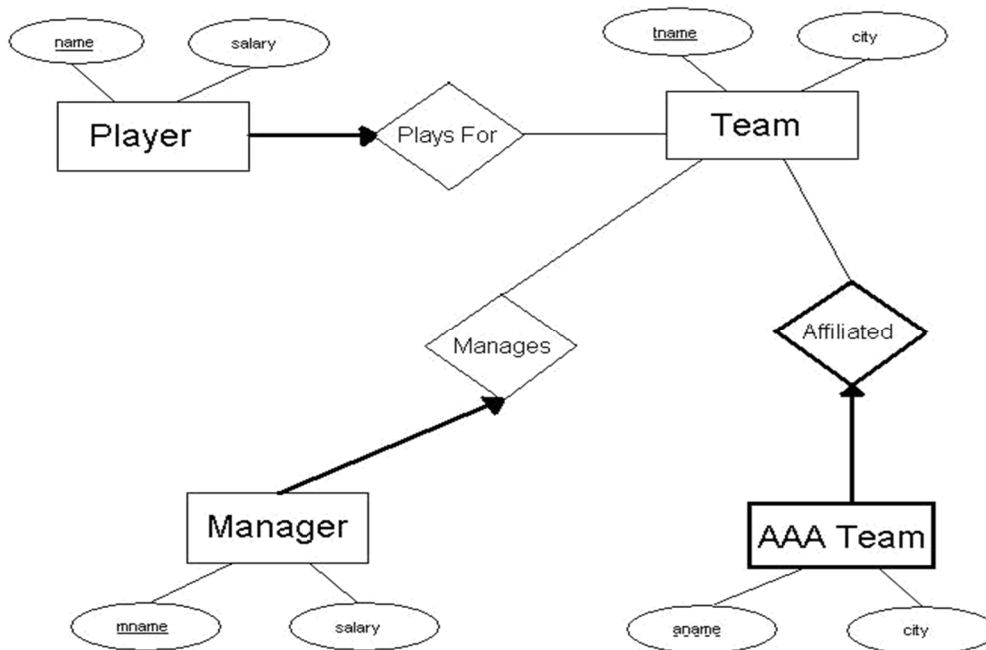
QUESTION TWO (20 MARKS)

a) Draw an E-R diagram for the following situation:

- This is a simplified model for reserving baseball tickets.

- There are teams, which are identified by the team name. Teams are also located in a city.
 - Teams play each other in games, which occur on a particular date at a particular time. Games are identified by a game ID, and each game has exactly two teams that play in it.
 - A game is played in exactly one stadium.
 - A stadium is identified by its name, and is also located in a city.
 - Stadiums have seats, which have a section number, a row number, and a seat number.
 - Ticket holders reserve seats for a game. Ticket holders are identified by their name.
 - Some ticket holders are students (students get discounts, but we are not including that in the model).
- (10 marks)

- b) Using SQL, convert the following ER diagram to the relational model. Hint: You do not need CHECK constraints. (10 marks)



QUESTION THREE (20 MARKS)

- a) List and explain FOUR different constraints in generalization and specialization. Show also the symbols used to show the constraints. (8 marks)
- b) Consider the following relation that keeps track of student enrolment in courses and the books adopted for each course.

STUDENT (San, Name, Major, Bdate)

COURSE(Course#, Cname, Dept)

ENROLL(San, Course#, Quarter, Grade)

BOOK_ADOPTION(Course#, Quarter, Book_isbn)

TEXT(Book_isbn, Book-title, Publisher, Author)

Specify the foreign keys for this schema, stating any assumptions you make. (4mks)

- c) The database below stores students and courses.

STUDENT

Name	Student_number	class	Major
Smith	17	1	CS
Brown	8	2	CS

COURSE

Course-name	Course-number	Credit-hours	Department
Intro to computer science	CS1310	4	CS
Data structures	CS3929	4	CS
Discrete mathematics	MATH2410	3	MATH
Database	CS3380	3	CS

SECTION

Section-identifier	Course-number	semester	year	instructor
85	MATH210	Fall	07	King
92	CS1310	Fall	07	Anderson
102	CS3320	Spring	08	Knuth
112	MATH2410	Fall	08	Chang
119	CS1310	Fall	08	Anderson
135	CS3380	Fall	08	Stone

GRADE-REPORT

Student-number	Section-identifier	Grade
17	112	B
17	119	C
8	85	A
8	102	B
8	135	A

PREREQUISITE

Course-number	Prerequisite-number
CS3380	CS3320
CS3380	MATH2410
CS3320	CS1310

Write SQL update statements to do the following on the above database schema

- Inserts a new student, < 'Johnson', 25, 1, 'Math'>, in the database.
- Change the class student 'Smith' to 2.

- c. Insert new course < 'Knowledge Engineering', 'CS4390',3 'CS'>.
 - d. Delete the record for the student whose name is 'Smith' and whose student number is 17.
- (8mks).

QUESTION FOUR (20 MARKS)

- a) The relational schema shown below can be used for collecting information on repayments of micro loans.

Repayment(borrower_id,name,address,loanamount,requestdate,repayment_date,request_amount)

A borrower is identified with a unique borrower_id, and has only one address. Borrowers can have multiple simultaneous loans, but they always have different request dates. The borrower can make multiple repayments on the same day, but not more than one repayment per loan per day.

- i. State a key (candidate key) for Repayment. (2 marks)
 - ii. Make the normalization to BCNF. State for every step in the normalization, which functional dependency that causes it. (8 marks)
- b) The problem below is about writing an SQL relation from the Repayment problem above. Repayment(borrower_id,name,address,loanamount,requestdate,repayment_date,request_amount) use information provided in three (I) above.
- i. Write an SQL request that returns all the tuples with information on repayments from the borrower with Id equal to 42, and where the loan amount exceeds 1000 USD. (5 marks)
 - ii. Write an SQL command, which deletes all information on ended loans, which is to say loans where the total repaid amount equals the lend amount. (5 marks)

QUESTION FIVE (20 MARKS)

- a) Explain at least FIVE advantages of Distributed Databases. (10 marks)
- b) Clearly explain the following terms as used in object databases. (10 marks)
- i. Encapsulation
 - ii. Operator overloading
 - iii. Persistent collection
 - iv. Transient collection
 - v. Multiple inheritance.