


National University of Computer and Emerging Sciences, Lahore Campus

	Course Name:	Database Systems	Course Code:	CS203
	Program:	BS(CS)	Semester:	Fall 2018
	Duration:	3 Hours	Total Marks:	70
	Paper Date:	Mon 24-Dec-2018	Weight	45%
	Section:	ALL	Page(s):	8
	Exam Type:	Final		

Student : Name: _____ **Roll No.** _____

Section: _____

- Instructions/Notes:**
1. Scratch sheet can be used for rough work however, all the questions and steps are to be shown on question paper. No extra/rough sheets should be submitted with question paper.
 2. You will not get any credit if you do not show proper working, reasoning and steps as asked in question statements.

Q1. (5 points) Consider the relation $R(A, B, C, D, E)$, with FDs $\{A \rightarrow BC, C \rightarrow D, E \rightarrow D, BE \rightarrow A\}$. List all the possible keys of R . Show the intermediate steps of your derivation. Also Identify the best normal form that R satisfies.

Q2. (5 points) Consider a relation with schema $R(A, B, C, D, E, G)$, with FDs $F = \{D \rightarrow G, C \rightarrow A, CDB \rightarrow E, A \rightarrow B\}$. Identify the best normal form that R satisfies (1NF, 2NF, 3NF, or BCNF). Justify your answer. If R is not in BCNF, decompose it into a set of BCNF relations and show your steps. Indicate which dependencies if any are not preserved by the BCNF decomposition.

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Q3. (5 points) Consider the following relation and compute the closure of $\{A\}^+$, $\{B\}^+$, $\{C\}^+$, $\{D\}^+$, and $\{CD\}^+$. Show your work.

R

A	B	C	D
1	2	3	4
4	2	3	4
5	3	3	4

Q4. (5 points) Consider the following two sets of FDs. Check whether or not they are equivalent. Provide proper reason.

$F1 = \{A \rightarrow C, B \rightarrow C, C \rightarrow AB\}$ and $F2 = \{A \rightarrow BC, B \rightarrow A, C \rightarrow A\}$.

Q5. (15 points) Consider the following tables from an internet movie database. Primary keys are underlined and the column *fid* is a foreign key in the table *ratings*. The ratings are on the scale 1-5, where 5 is best and 1 is worst.

Films

<u>fid</u>	title	yrrelease
f1	Title1	2016
f2	Title2	2018
f3	Title3	2018
f4	Title4	2017
f5	Title5	2017
f6	Title6	2018

**Rating
s**

<u>viewerid</u>	<u>fid</u>	rating
v10	f1	1
v30	f1	1
v50	f1	5
v20	f3	1
v30	f3	5
v50	f3	1
v60	f3	5
v10	f5	1
v90	f5	3
v50	f5	1
v70	f5	5
v80	f5	1

Write the result of the following queries for the database state given above.

queries for the database state given

- SELECT films.title, COUNT(rating) AS worstRatings FROM films JOIN ratings ON films.fid = ratings.fid
WHERE yrrelease > 2016 AND rating=1 GROUP BY film.title HAVING COUNT(rating) >= 2
ORDER BY COUNT(rating);
- Result $\leftarrow \sigma_{\text{viewerid} = v90 \text{ OR } \text{viewerid} = \text{NULL}} (\text{films} \bowtie \text{ratings})$
- Write SQL statement to **create** the **Ratings Table** given above. Also specify PK constraint on (*viewerid*, *fid*) columns, FK constraint on *fid* column and CHECK constraint on *rating* column that ensures that rating is between 1 and 5 inclusively.

Q6. (10 points) For the above movie database, Specify the **SQL and RA statements** to answer the following questions:

a. Which are the newest films? Do not hardcode SQL/RA statement. It must be generic.

b. For each film, give the number of views and the percentage of best ratings received. Sample output is as follows:

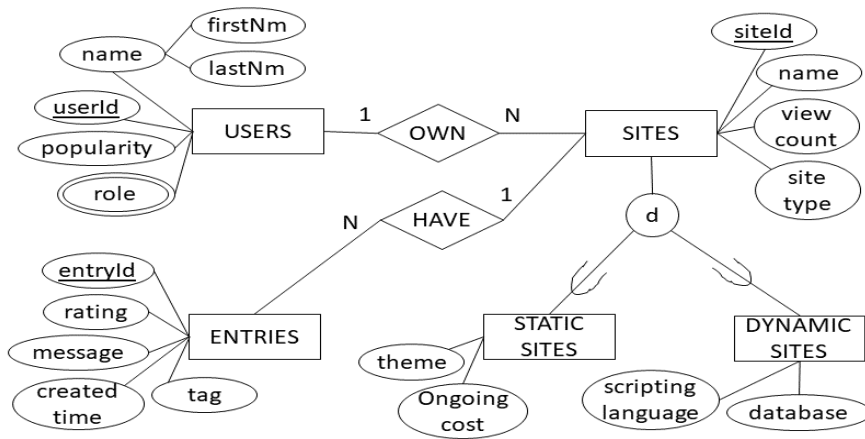
<u>fid</u>	<u>TotalViews</u>	<u>%bestRatings</u>
<i>f1</i>	<i>3</i>	<i>33</i>
<i>f3</i>	<i>4</i>	<i>50</i>
<i>f5</i>	<i>5</i>	<i>20</i>

Q7. (10 points) Draw an ER diagram for the following case study. Your diagram should indicate the keys of all entities, as well as the cardinality and participation constraints of all relationships. Note any unspecified requirements, and make appropriate assumptions to make the specification complete but clearly state your assumptions along the diagram.

The database supports the placement office of a leading graduate school of computing. The primary purpose of the database is to schedule interviews and facilitate searches by students and companies. Consider the following requirements:

- Student data include a unique student identifier, a name, a phone number, an email address, a major, a minor, and a GPA.
- The placement office maintains a standard list of positions based on the Labor Department's list of occupations. Position data include a unique position identifier and a position description.
- Company data include a unique company identifier, a company name, and a list of positions and interviewers. Each company must map its positions into the position list maintained by the placement office. For each available position, the company lists the cities in which positions are available.
- Interviewer data include a unique interviewer identifier, a name, a phone, an email address, and a web address. Each interviewer works for one company.
- An interview includes a unique interview identifier, a date, a time, a location (building and room), an interviewer, and a student.

Q8. (5 points) Map following EER diagram into a relational model.



Q9. *(10 points)*

- a.** Discuss the ACID properties of a database transactions. What is the system log used for?
- b.** How does a category differ from a regular shared subclass? What is a category used for? Illustrate your answer with example.