

Name:

CWID:

**Instructions:**

Answer ALL questions (100 pts).

Time allowed: 2 hours.

1. The table below is ordered ascendingly (lowest to highest) using score attribute. Use the data given in the table to answer the following questions. **[Assume the table name: Student]**

row_num	first_name	last_name	score
1	Jonathan	Taylor	10
2	Daniel	Faviet	20
3	Alex	Hunold	20
4	Den	Raphael	20
5	Herman	Baer	60
6	Nancy	Greenberg	80
7	Micheal	Hartstein	80
8	James	Madison	100

- a. Write the SQL commands that would compute for the following advanced aggregate window functions: i) PERCENT\_RANK and ii) CUME\_DIST **[8 pts]**. **Your query should be able to format your values to 2 decimal places.**

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- b. Draw a table to illustrate the expected output/values if the SQL commands in (a) above would be executed. Your table should include PERCENT\_RANK and CUME\_DIST columns, along with all the fields in student table **[10 pts]**.

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2. Create an Entity Relationship Diagram (ERD) using CHENs notation after studying the College business rules below. Also, you are required to present the relation schemas including primary keys (PKs) and foreign keys (FKs) that fully represent the database at a logical level.
- A student can register for more than one degree over time, and many students can register for the same degree.
  - Each degree consists of many modules that you must complete. And a module may be part of multiple degrees.
  - The number of credits for the module should be stored in the database too.
  - A student may register multiple times for the same module, and the final mark and grade should be recorded for each module registration.
  - The name, surname, and student number should be recorded for each student.
  - A student also registers to study at a specific campus. Each campus has a name.

Rubric	pts
Entities	6
Relationships with correct participation and cardinalities	6
Relation schemas showing PKs and correct FK postings	12
Correct format for CHENs notation	1
Total	25

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**[Draw Entity Relationship Diagram (ERD) here]**

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[Write the relation schemas here, in the format below]

**Student (StudentID, StudentName, StudentDoB, etc)**

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3. Normalize the data given in the table below to the third normal form (3NF). Show all the steps in your normalization (i.e., 1NF, 2NF and 3NF) and the resulting tables (must show data in each table). Clearly label each normal form so that marks can be awarded at each stage of your normalization **[25 pts]**.

COURSE_ID	COURSE_NAME	PROF_ID	PROF_NAME	SUBJECT_CODE	SUBJECT_NAME	SEMESTER_DATE	HOURS
CS3001	COMPUTER SCIENCE	P0108	Dexter Cobb	NETW101	NETWORKS	01/01/2020	10
CS3001	COMPUTER SCIENCE	P0124	Fabian Bond	PROG202	PROGRAMMING II	01/01/2020	16
CS3001	COMPUTER SCIENCE	P0140	Shane Williamson	DATA202	DATABASE ORGANIZATION	01/01/2020	10
FA3001	FINANCIAL ACCOUNTING	P0110	Keith Currey	ACC0101	ACCOUNTING I	01/02/2020	10
FA3001	FINANCIAL ACCOUNTING	P0140	Shane Williamson	DATA202	DATABASE ORGANIZATION	01/02/2021	8
FA3001	FINANCIAL ACCOUNTING	P0124	Fabian Bond	FINA202	FINANCE II	01/02/2020	12

[illegible]



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ii. Does  $AB \rightarrow EF$ ? Provide an explanation [4 pts]

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iii. Is R in 1NF/2NF/3NF/BCNF, and explain why? [4 pts]

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- b. Given the relation,  $R = (A, B, C, D, E, G)$  and a set of functional dependencies,  $F = \{A \rightarrow BCD, BC \rightarrow DE, B \rightarrow D, D \rightarrow A\}$ . Compute the canonical (minimal) cover of  $F$  **[10 pts]**.

[illegible]

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5. Consider the relation schema  $R(A,B,C,D,E)$  with data values given in each tuple,  $t_1, \dots, t_4$  [8 pts].

	A	B	C	D	E
$t_1$	1	3	4	0	4
$t_2$	1	3	4	2	2
$t_3$	2	3	5	0	1
$t_4$	2	3	5	1	3

Which of the following functional dependencies will HOLD in the above relation (**select or circle all that apply**)

- a.  $CD \rightarrow B$
- b.  $C \rightarrow D$
- c.  $E \rightarrow ABCD$
- d.  $C \rightarrow A$
- e.  $D \rightarrow E$
- f.  $BE \rightarrow DB$

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END