



**German University in Cairo
Faculty of Media Engineering and Technology**

CSEN604: Databases II

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**Quiz 3 Solution
CSEN & BI**

**April 26th, 2018
30 minutes**

NAME: _____

Major: _____ **ID:** _____ **Group:** _____

Do **not** turn this page until you have received the signal to start.
In the meantime, read the instructions below carefully.

This quiz consists of 2 questions on 4 pages (*including this one*), printed on one side of the paper. When you receive the signal to start, please make sure that your copy is complete.

Answer each question directly on the quiz paper, in the space provided, and **use the reverse side of the page for rough work**. If you need more space for one of your solutions, use the reverse side of the page and indicate **clearly** the part of your work that should be marked.

Q1. _____ / 14 (Logging & Recovery)

Q2. _____ / 6 (Serializability)

_____ / 20 **TOTAL**

1) [14 marks] **Logging and Recovery**

Consider a database that has six elements - A, B, C, D, E and F. The initial values of the elements are:

$$A = 10, B = 20, C = 30, D = 40, E = 50, F = 60$$

Let there be three transactions U, V and W that modify these elements concurrently.

- U: A := 5, B := 15, D := 30
- V: C := 25
- W: E := 35, F := 45

While the elements are being modified by the transactions, the database system crashes. The recovery mechanism depends on the logging scheme we use. In the questions below, we present the contents of the log at the time of crash and state the logging scheme used. (For each log entry we give the relevant data, as discussed in class examples.)

For each question, your task is to identify if a combination of values of the elements is possible in the disk at the time of crash and to help recover the database elements.

a) [7 marks] Undo logging is used.

< START U >
< U, A, 10 >
< START V >
< U, B, 20 >
< V, C, 30 >
< COMMIT V >
< START CKPT(U) >
< START W >
< U, D, 40 >

the following state of database elements (on disk) possible at the time of crash?

A = 5, B = 20, C = 25, D = 40, E = 50, F = 60 TRUE or FALSE? **TRUE**

What are the values of the database elements after a successful recovery?

A=10 B=20 C=25 D=40 E=50 F=60

b) [7 marks] Undo-redo logging

< START U >
< U, A, 10, 5 >
< START V >
< U, B, 20, 15 >
< V, C, 10, 25 >
< COMMIT V >
< START CKPT(U) >
< START W >
< U, D, 40, 30 >
< W, E, 50, 35 >
< END CKPT >
< COMMIT U >
< W, F, 60, 45 >

Is the following state of database elements (on disk) possible at the time of crash?

A = 10, B = 20, C = 25, D = 40, E = 50, F = 60 TRUE or FALSE? FALSE

What are the values of the database elements after a successful recovery?

A=5 B=15 C=25 D=30 E=50 F=60

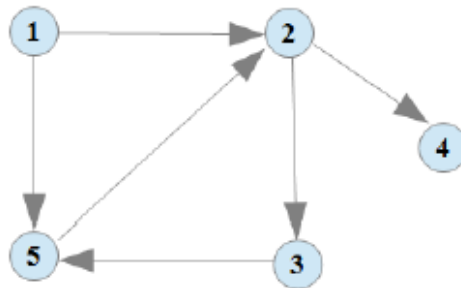
2) [6 marks] Serializability

Consider the following schedule:

$S_b : r_1(X) w_1(X) r_5(X) r_2(Y) w_3(Y) r_2(X) r_2(Z) w_2(X) r_5(Y) w_4(Z)$

Draw the precedence graph for this schedule, and use it to determine if the schedule is conflict serializable.

Precedence graph:



Serializable? (Yes or No): **No**