Assignment 2

Please make sure that you always use notations consistent with lecture notes. Different notations will not be accepted. The deadline for assignment 2 is:

Fri 17, Apr 5:00 pm

Question 1 (16 marks)

Consider a relation $R(A, B, C, D, E, G, H, I, J)$ and its FD set $F = \{AB \rightarrow DE, C \rightarrow GH, E \rightarrow BCD, D \rightarrow CI, H \rightarrow G, EH \rightarrow I\}$.

1) Check if $E \rightarrow G \in F^+$. Justify your answer. (2 mark)

2) List all the candidate keys for R. (2 marks)

3) How many super keys can be found for R? Compute the total number of super keys and list 5 of them. (2 marks)

4) Find a minimal cover F_m for F. (2 marks)

5) Determine the highest normal form of R with respect to F. Justify your answer. (2 marks)

6) Regarding F, is the decomposition $R_1 = \{ABCDE\}$, $R_2 = \{CGH\}$, $R_3 = \{EIJ\}$ of R dependency-preserving? Please justify your answer. (2 marks)

7) Regarding F, is the decomposition $R_1 = \{ABCDE\}$, $R_2 = \{CGH\}$, $R_3 = \{EIJ\}$ of R lossless-join? Please justify your answer. (2 marks)

8) Decompose it into a collection of BCNF relations if it is not in BCNF. Make sure your decomposition is lossless-join and briefly justify your answers. (2 marks)

Question 2 (8 marks)

Consider the schedule below. Here, R(*) and W(*) stand for 'Read' and 'Write', respectively. T_1 , T_2 , T_3 and T_4 represent four transactions and t_i represents a time slot.

Time	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}	t_{11}	t_{12}
T_1	R(B)					R(A)	W(B)				W(A)	
T_2			R(A)		R(A)				R(B)	W(B)		W(A)
T_3								R(B)				W(B)
T_4		R(A)		W(A)						R(B)	W(B)	

Each transaction begins at the time slot of its first Read and commits right after its last Write (same time slot).

Regarding the following questions, give and justify your answers.

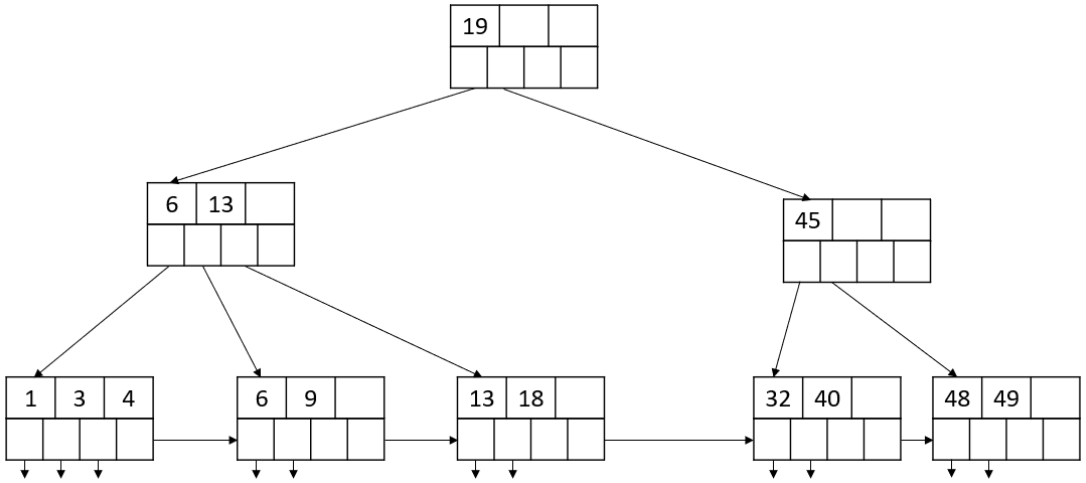
1) Assume a checkpoint is made between t_4 and t_5, what should be done to the four transactions when the crash happens between t_6 and t_7. (2 marks)

2) Is the transaction schedule conflict serializable? Give the precedence graph to justify your answer. (2 marks)

3) Give a serial schedule of these four transactions. (2 marks)

4) Construct a schedule (which is different from above) of these four transactions which causes deadlock when using two-phase locking protocol. If no such schedule exists, explain why. (2 marks)

Question 3 (6 marks)



1) There are currently 11 records in this tree. How many additional records could be added to this tree without changing its height (give the maximum possible number)? (3 marks)

2) Show the B+ tree after deleting the data entry with key 49 from the original tree. (3 marks)

Assignment Submission

We accept electronic submissions only. Please submit your assignments as follows:

- The file name should be ass2.pdf.
- Log into the CSE server, record the submitting file in your CSE account. So that we can retrieve it in case, your submission fails --- usually, the submission should not fail. We will look at the time-step of your file in CSE account. It is important not to modify your file in CSE account after the deadline.
- Note: we only accept files with .pdf extension
- Type "give cs9311 ass2 ass2.pdf" to submit.
- You can also use the web give system to submit.
- In case that the system is not working properly, you **must** take the following actions:
  1) Please keep a screen capture (including your **zid**, the submission **timestamp** and the **size** of the submitted file) for your submissions as proof. If you are not sure how, please have a look at the guidelines.
  2) Please keep a copy of your submitted file on the CSE server. If you are not sure how, please have a look at taggi.

Note:

1. If the size of your pdf file is larger than 2MB, the system will not accept the submission. If you face this problem, try converting to compress pdf.
2. If you have any problems in submissions, please email to comp9311unsw@gmail.com.
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Late Submission Penalty

0 mark.