

# Assignment 2

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

**Fri 04 May, 5:00 pm**

## Question 1 (10 marks)

Consider a relation  $R(A, B, C, D, E, G, H, I, J, K)$  and its FD set  $F = \{A \rightarrow BC, E \rightarrow AD, BD \rightarrow E, CE \rightarrow DH, H \rightarrow G, EI \rightarrow J\}$ .

- 1) Check if  $C \rightarrow J \in F^+$ . (1 marks)
- 2) Find a minimal cover  $F_m$  for  $F$ . (2 marks)
- 3) Regarding  $F$ , is the decomposition  $R_1 = \{ABCDE\}$ ,  $R_2 = \{EGH\}$ ,  $R_3 = \{EIJK\}$  of  $R$  lossless-join? Please justify your answer. (2 marks)
- 4) List at least 5 super-keys for  $R$ . (2 marks)
- 5) Is it possible to decompose  $R$  into a collection of BCNF relations and ensure the decomposition is dependency-preserving and lossless-join? Please justify your answers. (3 marks)

## Question 2 (6 marks)

Following is the schedule A for transactions  $T_1$ ,  $T_2$ , and  $T_3$ :

Schedule A

Transaction \ Time	$T_1$	$T_2$	$T_3$
1	<del>write(X)</del> read(X)		
2			read(Z)
3		<del>write(X)</del> read(X)	
4	<del>write(Z)</del> read(Z)		
5		read(Z)	
6			<del>write(Y)</del> read(Y)

7			
8			
9			<del>write(X)</del> read(X)
10	read(Y)		

- 1) Assume that the system crashes at time 8, what should be done to recover the system? (3 marks)
- 2) Assume a checkpoint is made at time 7, what should be done to the three transactions when the crash happens at time 8? (3 marks)

Note: We assume a transaction will be committed immediately after all the read/write operations of it are done.

### Question 3 (4 marks)

Give and justify the answers regarding the following problems:

- 1) Construct a scenario that First in First Out (FIFO) buffer replacement policy is better than Most Recently Used (MRU) buffer replacement policy. (2 marks)
- 2) Construct a scenario that First in First Out (FIFO) buffer replacement policy is better than Least Recently Used (LRU) buffer replacement policy. (2 marks)

## Assignment Submission

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

- The file name should be **ass2.pdf**.
- Ensure that you are in the directory containing the file to be submitted. (note: we only accept files with .pdf extension)
- Type “give cs9311 ass2 ass2.pdf” to submit.
- Please keep a screen capture (including **timestamp** and the **size** of submitted file) for your submissions as proof in case that the system is not working properly. If you are not sure how, please have a look [here](#).

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 compressed pdf.
2. If you have any problems in submissions, please email to [kai.wang@unsw.edu.au](mailto:kai.wang@unsw.edu.au).

3. We do not accept e-mail submissions, and the submission system will be immediately closed after the deadline.

## **Late Submission Penalty**

Zero mark