Department of Computer Science and Engineering
University of Rajshahi
Sample Question

Course Title; Database Management System — Course code: CSE- 3121 Full marks:52.5 — Time: 3 Hours

[Answer three questions from each part]

Part A

1(a)	Explain the distinctions among the terms primary key, candidate key, and super key.	2
	Consider the E-R diagram in Figure 1, which models an online bookstore. Derive the table(s) for relationship set and entity set from Figure 1. Suppose the bookstore adds music cassettes and compact disks to its collection. The same music item may be present in cassette or compact disk format, with differing prices. Extend the E-R diagram to model this addition (for simplicity, you may ignore the effect on shopping baskets).	6.75
2(a)	Express the operation of Deletion, Insertion and updating in relational algebra.	3
(b)	A relation s is given in Figure 2 and another relation r is given in Figure 3, Find the r÷s, show output of each operation (Natural join, Projection etc) involved in r÷s.	5.75
3(a)	What are tests those must be made in order to preserve the following referential integrity constraint $\prod_{\alpha}(r_2) \subseteq \prod_{K}(r_1)$ for Insert and Update operation.	2
(b)	Given the relations: branch (branch_name, branch_city, assets), customer (customer_name, customer_street, customer_city), account (account_number, branch_name, balance), loan (loan_number, branch_name, amount), depositor (customer_name, account_number), borrower (customer_name, loan_number Write relational algebra for the following quarry: (i) Find all customers who have an account at all branches located in Rajshahi city. (ii) Find all customers who have an account from at least the "Rajshahi" and the "Dhaka" branches.	3
(c)	For the relations given in Figure 4, derives the contents of relations for natural-join, left-outer-join, right-outer-join and full-outer-join.	3.75
4(a)	Compare Oracle with SQL server.	2
(b)	Consider the relations given in Figures 5-8, and then derive the contents of the relation found from the following query: (i) **select** *customer-name* **from** *customer* **where** *customer-street* **like** '%Main%' (ii) **select** *customer-name* **from** *depositor*) **union** (**select** *customer-name* **from** *borrower*) (iii) **select** *branch-name*, **avg** (*balance*) **from** *account* **group by** *branch-name*	4.75
(c)	Where and why do you need SQLite?	2
	Part-B	
5(a)	Compare Oracle with MySQL	2
(b)	What are the different states of transaction? Give some example of non-ACID Transactions.	2
(c)	What will happen if transaction T1 is followed by T2 instead of as described in schedule 1. Explain if there is any problem or inconstancy that may occur in schedule, 2, and 3. (in Fig, 9, 10 and 11 respectively)	4.75
6(a)	What are software RAID and hardware RAID? Explain Block-level striping and Bit-level striping? What is an Elevator Disk-arm–scheduling algorithm? Explain RAID Levels 2 and 3.	4.75
(b)	What are *exclusive (X) mode and shared (S) mode?.* Explain *Lock-compatibility matrix.* What will happen in partial schedule as given in Figure. 12?	4

7(a)	What is Big Data? What are usual techniques to handle Big Data?	2
(b)	Explain the Figure. 13 describing data access from a storage.	3
(c)	When *Deferred database modification* approach is used, how does log look like at different instances of time for the transactions T_0 and T_1 (T_0 executes before T_1): as given in Figure. 14.	3.75
8(a)	For R = (A, B, C), F = {A → B, B → C), if R is decomposed in (i) R1 = (A, B), R2 = (B, C) and (ii) R1 = (A, B), R2 = (A, C), then explain whether they are Lossless-join decomposition and/or Dependency preserving	2
(b)	If, **r** in Figure. 15 is decomposed in **r1** and **r2**, will it be lossy-join or lossless-join decomposition? Explain your answer. how show as dependency preserving?	2
(c)	Given relation schema R = {A, B, C, D, E}. and FDs A → BC, CD → E, B → D, E → A, now find out $A)^+$, $(AB)^+$, $(BC)^+$, $(ABC)^+$.	2
(d)	The given relational scheme R with attributes A,B,C,D,F and the FDs A → BC, B → E, CD → EF, prove that functional dependency AD → F holds in R.	1.25
(e)	Given $F = \{A \rightarrow C, AB \rightarrow C\}$, prove that B is extraneous in $\boldsymbol{AB \rightarrow C}$.	1.5

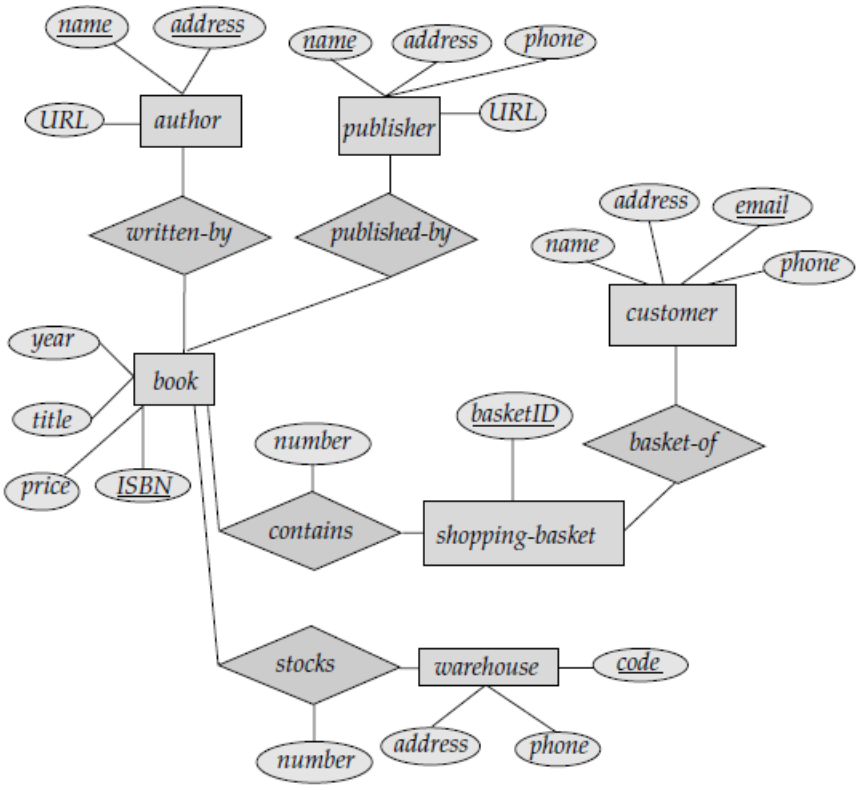

Figure .1

X1	X2	Y1	Y2
A	1	P	3
B	1	Q	2
A	1	P	3
C	2	P	1
A	1	P	1
B	1	Q	2
A	1	P	2
C	2	P	2
A	1	Q	2

Figure. 2

Y1	Y2
P	1
P	2
Q	2

Figure 3

loan_number	*branch_name*	*amount*
L-170	Downtown	3000
L-230	Redwood	4000
L-260	Perryridge	1700

Loan relation

customer_name	*loan_number*
Jones	L-170
Smith	L-230
Hayes	L-155

borrower relation

Figure. 4

account-number	*branch-name*	*balance*
A-101	Downtown	500
A-215	Mianus	700
A-102	Perryridge	400
A-305	Round Hill	350
A-201	Brighton	900
A-222	Redwood	700
A-217	Brighton	750

The account relation
Figure. 5

customer-name	*account-number*
Hayes	A-102
Johnson	A-101
Johnson	A-201
Jones	A-217
Lindsay	A-222
Smith	A-215
Turner	A-305

The depositor Relation
Figure 6

customer-name	*customer-street*	*customer-city*
Adams	Spring	Pittsfield
Brooks	Senator	Brooklyn
Curry	North	Rye
Glenn	Sand Hill	Woodside
Green	Walnut	Stamford
Hayes	Main	Harrison
Johnson	Alma	Palo Alto
Jones	Main	Harrison
Lindsay	Park	Pittsfield
Smith	North	Rye
Turner	Putnam	Stamford
Williams	Nassau	Princeton

The customer Relation
Figure 7

customer_name	*loan_number*
Adams	L-16
Curry	L-93
Hayes	L-15
Jackson	L-14
Jones	L-17
Smith	L-11
Smith	L-23
Williams	L-17

The borrower relation
Figure 8

T_1	T_2
	read(A)
	$temp := A * 0.1$
	$A := A - temp$
	write(A)
	read(B)
	$B := B + temp$
	write(B)
read(A)	
$A := A - 50$	
write(A)	
read(B)	
$B := B + 50$	
write(B)	

Figure. 9 (Schedule 1)

T_1	T_2
read(A)	
$A := A - 50$	
	read(A)
	$temp := A * 0.1$
	$A := A - temp$
	write(A)
	read(B)
write(A)	
read(B)	
$B := B + 50$	
write(B)	
	$B := B + temp$
	write(B)

Figure. 10 (Schedule 3)

T_1	T_2
read(A)	
$A := A - 50$	
write(A)	
	read(A)
	$temp := A * 0.1$
	$A := A - temp$
	write(A)
read(B)	
$B := B + 50$	
write(B)	
	read(B)
	$B := B + temp$
	write(B)

Figure. 11 (Schedule 3)

T_3	T_4
lock-X(B)	
read(B)	
$B := B - 50$	
write(B)	
	lock-S(A)
	read(A)
	lock-S(B)
lock-X(A)	

Figure. 12

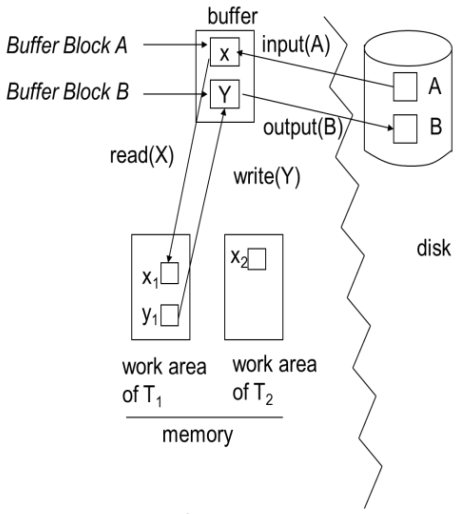

Figure. 13

T_0: **read** (A)
A: - A - 50
Write (A)
read (B)
B:- B + 50
write (B)

T_1 : **read** (C)
C:- C- 100
write (C)

Figure.14

A	B
α	1
α	2
β	1

r

A
α
β

r1

B
1
2

r1

Figure.15