Hajee Mohammad Danesh Science and Technology University, Dinajpur
Department of Computer Science and Engineering
B. Sc. in Electronics and Communication Engineering
Semester Final Examination 2017(Jan-Jun)
Level 3, Semester I, Course Code: CSE 315, Credit: 3.0
Course Title: Database Management System (Theoretical)

Total Marks: 90

Time: 3 hours

[N.B. The figure in the right margin indicates the marks allocated for respective question. Split answer of any question is not allowed]

Section-A

(Answer any 3 (three) questions)

1. (a) What is a Database system and DBMS? Why do we need DBMS? 2+2
   (b) What is data abstraction? Describe the three levels of data abstraction. 5
   (c) How is traditional file processing different from database approach? 6

2. (a) Define anomalies. Explain different types of anomalies that exist in database system. 1+3
   (b) What is normalization? Why a relation that is in 3NF generally considered good? 1+1+2
   (c) Consider the following table. Do you think it is normalized? If not then normalize the table into 3NF. 7

   Eum = Employee number, Ename = Employee Name, Stbranch = Store Branch
   Sprice = Sales price, ItemDesc = Item Description

Enum	Ename	Stbranch	Dept	ItemNo	ItemDesc	Sprice
211306801	Jim	Downtown	Hardware	TR100 SA10 PT 165 AB165	Router Saw Drill Lawnmower	$35 $19 $21 $245
301421011	Bill	Dadeland	Home Appliance	TT14 DS104	Humidifier Dishwasher	$114 $262
419846204	A. Jim	Cutler Ridge	Auto Parts	MC164 AC1462 BB1000	Snow tire Alternator Battery	$85 $65 $49

3. (a) Consider the Data Base described in the following text. 2×3 = 6
   author(author_id, first_name, last_name)
   author pub(author_id, pub_id, author_position)
   book(book_id, book_title, month, year,editor)
   pub(pub_id, title, book_id)
   Give a Relational Algebra expression for each of the following operations:
   i. Find the names of all authors who are book editors.
   ii. Find the names of all authors who are not book editors.
   iii. Find the names of all authors who have at least one publication in the database.
   (b) Explain the terms relation and relational schema. Discuss the different fundamental relational algebra operations. 2+7

4. (a) What is RAID? Explain different RAID levels with diagram. 1+5
   (b) When is it preferable to use a dense index rather than a sparse index? Explain with example. 5
   (c) Explain the structure of a B^+-tree with diagram. 4

Section-B

(Answer any 03(three) questions)

1. (a) Define E-R model. Explain different types of attributes used to design an E-R diagram. 1+3

   (b) Assume that you are a member of a project team made to automate the overall functionalities performed in **HSTU Central Library**. You have to draw the E-R diagram of the system. Explain those considerations which you must take, and then also draw the complete E-R diagram with necessary explanations so that it will be easily understandable for the other members of your team. 11

2. (a) What is transaction in a DBMS? Explain the ACID properties with examples. 1+4

   (b) Discuss the problems of deadlock and starvation in transaction processing and the different approaches to deal with these problems. 2+2

   (c) Consider the following two transactions: 3+1+2

   T_1: *read(A);*
   read(B);
   if A = 0 then B := B + 10% of B;
   write(B).

   T_2: *read(B);*
   read(A);
   if B = 0 then A := A + 10% of A;
   write(A).

   Add lock and unlock instructions to transactions T_1 and T_2, so that they observe the two-phase locking protocol. Can the execution of these transactions result in a deadlock? Why?

3. (a) Define lock manager and lock table. Mention their purposes. 2+2

   (b) Explain how deadlock can be detected with an example. 5

   (c) Explain the issues that must be addressed in designing a remote backup system. 6

4. (a) Consider the following relational database schema 2×5 =10
   Student (Student-id, Sname, major, GPA)
   Faculty (Faculty-id, fname, dept, designation, salary)
   Course (Course-id, Cname, Faculty-id)
   Enrol (Course-id, Student-id, grade)
   Write the following queries in SQL:
   i. List the names of all students enrolled for the course "IS6T1".
   ii. List the names of all students enrolled for the course "IS6T1and have received "A" grade.
   iii. List all the departments having an average salary of above tk. 10,000.
   iv. Give a 20% raise to salary of all faculty.
   v. List the names of all faculty members beginning with "P" and ending with letter "A".

   (b) Explain with an example in SQL. 2.5+2.5
   i. HAVING clause
   ii. Aggregate functions and grouping