

The Open University of Sri Lanka
 B.Sc. Degree Programme: LEVEL 04
 Department of Mathematics and Computer Science
 Final Examination 2010/2011
CPU2241 – DATABASE MANAGEMENT SYSTEMS
DURATION: Three Hours (3 hours)



Date: 20/06/2011

Time: 9.30am – 12.30 pm

Answer **FOUR** Questions **Only**

QUESTION 1

- 1.1) Describe the difference between *data* and *information* using an example.
- 1.2) What is *data independence* and why it is important?
- 1.3) What is meant by the term *data anomaly*? Explain the three types of data anomalies using well defined single example.
- 1.4) Compare and contrast the database systems and file systems.
- 1.5) Briefly describe the terms database security management, data integrity management, data dictionary management in the context of DBMS functions.

QUESTION 2

- 2.1)
 - a) What is meant by an attribute in ER models?
 - b) Give three different types of attributes using suitable examples. You should use the correct symbols to illustrate the attribute type.
- 2.2)
 - a) Draw an ER diagram for the following situation stating appropriate assumptions.

A personal computer (PC) consists of many essential hardware parts in its system unit. These hardware parts could be a product of different manufacturers (Eg. VGA card produced by several manufacturers such as ATI or NVIDIA). Manufacturers sell these hardware parts through different resellers. Retail vendors order the hardware parts in large quantities from those resellers (not from manufacturers). Customers can only purchase these hardware parts from different retail vendors. A PC could be assembled from hardware parts purchased from a single vendor or from multiple vendors. Multiple PCs could be owned by a single customer.

- b) Give relations with appropriate attributes matching the ER diagram you have drawn for 2.2 a) above.

QUESTION 3

- 3.1) Explain the keywords *Relation*, *Attribute*, *Tuple* in the context of the relational model.
- 3.2) Compare and contrast *Hierarchical database model* and *Network database model* by taking a suitable example.
- 3.3) a) What is meant by the term *Relationship* in a Relational model?
b) Explain the importance of *foreign key* in a relationship in the context of relational model.
- 3.4) Consider the table structures below. Obtain the output of the operations which are given in relational algebra in part a) to part f).

T1
Custcode
112345
112545
112546

T2
Cucode
112385
112548
112345

T3		
Pcode	P_desc	P_price
2132	3V batt	45.00
2456	5A switch	140.00
2441	100W bulb	130.00

T4
Code
2132
2456

- a) T1.Custcode UNION T2.Cucode
b) T1.Custcode PRODUCT T4.Code
c) T2 JOIN T3
d) Custcode INTERSECT Cucode
e) Custcode DIFFERENCE Cucode
f) PROJECT Pcode and P_desc

QUESTION 4

- 4.1) State four types of users in a database system and briefly describe their functions.
- 4.2) In the context of relational database modeling, what are the three types of relationships with one, two and three participants? Also give an example for each type of relationship.
- 4.3) What two courses of action are available to a designer when a multi-valued attribute is encountered? Which action is better and why explain using an example.

- 4.4) Stating the assumptions, draw an ER diagram to match the following requirement.

An Institution has a group of scientists who conduct various experiments using chemical substances. Each experiment is requiring standard set of chemicals and testing equipment. The Equipments could be reusable but chemicals are not. They have to be ordered from internal store of the institution. The Store need to keep a standard set of chemicals in stock and the stock need to be always updated when a scientist orders for specific set of chemicals for experiments. Scientist can place an order for essential equipments and chemicals that are needed to carryout multiple experiments at once. The store has to purchase chemicals and equipments from different suppliers. Sometimes more than one scientist can participate in conducting experiment.

QUESTION 5

- 5.1) Why normalization is required for a relation.
- 5.2) State rules used to convert a relation to 1NF, 2NF, 3NF. (NF-Normal Form).
- 5.3) Obtain the 2NF and 3NF relations from the following table. Identify suitable Keys to the relations you obtain. State assumptions you make.

Stuid	stuname	staffid	staffname	classcode	enrollgrade
125	Janaka	25	nishantha	21334	A
125	Janaka	20	palitha	32456	C
135	Kumara	20	palitha	28458	B
144	Kelum	25	nishantha	27563	C
144	kelum	20	palitha	32456	B

- 5.4) Is it possible to convert the relation given above to BCNF ? If yes, then obtain the relation in BCNF.

QUESTION 6

- 6.1) a) What is SQL?
b) Give the difference between DML and DDL in the context of SQL.
- 6.2) Consider the following three tables. Primary keys are underlined. Jobtype and empid are foreign keys in the table Payment.

Based on the above information write SQL statements to create the table structures of jobrate, payment and person tables including the creation of proper primary and foreign keys. (Do not write SQL to insert the data into tables)

Table name: jobrate

<u>jobtype</u>	<u>brate</u>	<u>arate</u>
A	2000	1000
B	5000	1500

Table name: payment

<u>jobid</u>	<u>jobtype</u>	<u>bhrs</u>	<u>ahrs</u>	<u>empid</u>
a100	A	8	2	H2301
a102	A	6	2	H2305
a103	B	3	1	H2305

Table name: person

<u>empid</u>	<u>firstname</u>	<u>lastname</u>	<u>age</u>	<u>hometown</u>
H2301	kamal	silva	31	gampaha
H2302	kisani	pathirana	22	kandy
H2303	janaka	perumal	25	colombo
H2304	saman	silva	25	colombo
H2305	nishantha	rathnayaka	28	kandy
H2306	saman	rathnayaka	39	colombo

- 6.3) Based on the Table structure given in 6.2, write appropriate SQL statements to obtain results of following. (you do not need to write the output)
- Write a SQL statement to list all the people who are having their lastname as "rathnayaka"
 - Write a SQL statement to list firstname, hometown of the people who are having the character "s" as the 3rd letter of their firstname and aged more than 24 years.
 - Write a SQL statement to show town name and the number of people in each town in the descending order of the town name.
 - Write a SQL statement to add two years to the age of people who live in colombo or people who are having their names start with the letter "k"
 - Write a SQL statement to calculate the total payment for all the jobs carried out by the employee nishantha.
(formula: $\text{jobpayment} = \text{brate} \times \text{bhrs} + \text{arate} \times \text{ahrs}$)
 - Write SQL statements to add a new job of type C to the table jobrate with a brate of 10000 and arate of 3000. Then add a new job record to the table payment using following details.
jobtype C , empid H2302 , bhrs 2, ahrs 5, jobid A101.

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