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HIGHER DIPLOMA

DATABASE DEVELOPMENT (H4)

THURSDAY 6TH JUNE 2013

TIME: 10:00 TO 13:00 HOURS

DURATION: 3 HOURS

Candidates should answer ALL the questions in Part A and THREE of the five questions in Part B. Part A carries 40% of the marks available and Part B carries 60%. Candidates should allocate their time accordingly.

No reference material of any kind may be taken into the examination.

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PART A.
Answer ALL questions in this section.

Question A1.

Explain the term metadata in the context of a data dictionary and how a database management system makes use of it.

(5 marks)

Question A2.

End users in a database environment can be described as naïve or sophisticated. Explain how these different types may access the database.

(5 marks)

Question A3.

Briefly describe the meaning of the following aspects of Structured Query Language (SQL) data definition commands

CREATE TABLE
DROP TABLE
NOT NULL
DEFAULT
UNIQUE

(5 marks)

Question A4.

Explain the difference between a primary key and a foreign key using a suitable example to illustrate your answer.

(5 marks)

Question A5.

Give an example of a valid INSERT SQL statement. Give **TWO** reasons why a valid INSERT SQL statement might fail to insert data into a database? For each reason give an example.

(5 marks)

Question A6.

Describe the characteristics of a Distributed Database Management System.

(5 marks)

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Question A7.

Explain the difference between the hierarchical database model and the network model.

(5 marks)

Question A8.

Give a definition of the term “data mining” and when it may be used.

(5 marks)

Total 40 marks

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PART B.
Answer any THREE of the five questions in this section

Question B9.

The Three-Level ANSI-SPARC architecture is important in providing database management system (DBMS) functionality. Describe in detail the three levels using diagrams where appropriate.

(8 marks)

Explain why this architecture is so important.

(12 marks)
(Total 20 marks)

Question B10.

Dave Rave Promotions organises pop concerts in various countries. Part of the data that is stored to enable the company to keep track of who is performing and which company is supplying security for the event is shown below.

C#	CName	CDate	CVenue	S#	SName	SCont	A#	AName	ACont	Fee
C1	Rockit	1/6/13	Munich	S1	Bond	998123	A1	Locus	333456	4000
							A2	Freddie	665675	3000
C2	CoolTunes	4/8/13	Durban	S2	Mooney	888234	A1	Locus	333456	4500
							A3	Cheese	776345	2500
C3	Grunge	8/9/13	Istanbul	S1	Bond	998123	A1	Locus	333456	5000
							A2	Freddie	665675	4000
							A3	Cheese	776345	3500

C# - Concert number, a unique identifier
CName – Concert name
CDate – Concert date
CVenue – Concert venue
S# - Security firm number, a unique identifier
SName – Security firm name
SCont – Security firm contact
A# - Act number, a unique identifier
AName – Act name
ACont – Act contact
Fee – Fee to be paid to the act for that concert

Using this data explain the transformation into first, second and third normal form

(Total 20 marks)

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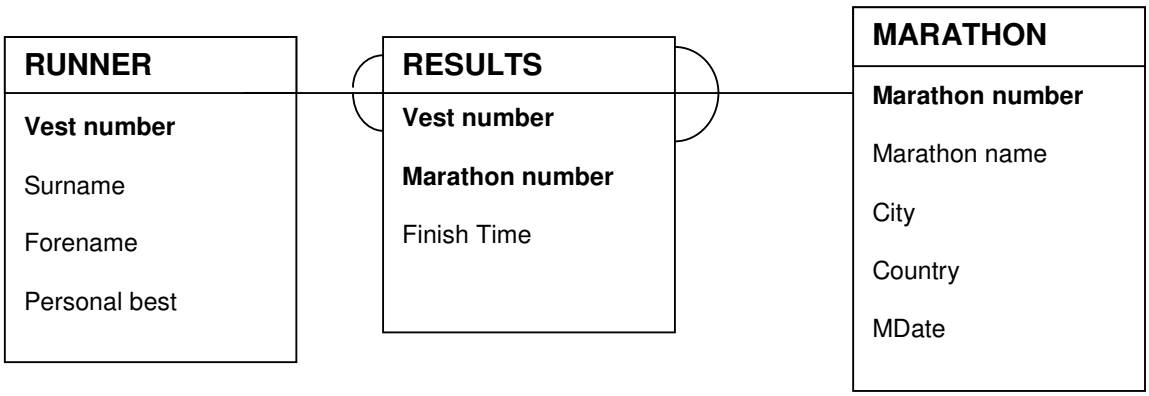
Question B11.

The following relationship model and table details indicate how data is stored for the recording of results in marathon events taking place throughout Africa.
Use the data definition to answer questions B11a, B11b and B11c :-

Marathon Database Tables and Relationships



Marathon				
Number	**Name**	**City**	**Country**	**MDate**
1	Marathon International de Marrakech	Marrakech	Morocco	27/01/2013
2	Deloitte Pretoria Marathon	Pretoria	South Africa	03/02/2013
3	Old Mutual Buffs Marathon	East London	South Africa	23/02/2013
4	Rwanda Challenge Marathon	Rwamgena	Rwanda	24/02/2013
5	Sahara Marathon	Tindouf	Algeria	25/02/2013
6	Kilimanjaro Marathon	Moshi	Tanzania	03/03/2013
7	Nedbank City of Cape Town Marathon	Cape Town	South Africa	22/09/2013

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Runner			
VestNumber	**Surname**	**Forename**	**PersonalBest**
122	Mboya	Frederick	02:33:12
134	Jones	Andy	03:54:35
456	Ledyard	Eric	04:09:30
467	Giroux	Pierre	03:45:40
565	Tchana	Merryman	04:00:30
587	Varney	Regina	04:03:43
677	Kuwali	Donna	03:44:50
809	Smithies	Ron	03:22:44
888	Mgano	Charles	04:00:04
899	Thomas	Mary	03:09:00

Results		
MarathonNumber	**VestNumber**	**FinishTime**
1	122	02:43:10
1	456	04:39:30
2	122	03:03:10
2	134	03:35:55
2	467	03:35:45
3	122	03:13:10
3	134	04:05:25
3	587	04:22:43
4	587	04:33:33
5	888	04:00:54
7	122	02:55:10
7	134	04:15:05
7	456	04:49:30
7	888	04:10:54
7	899	03:09:00

SouthAfricanMarathons		
MarathonName	**MDate**	**City**
Deloitte Pretoria Marathon	03/02/2013	Pretoria
Old Mutual Buffs Marathon	23/02/2013	East London
Nedbank City of Cape Town Marathon	22/09/2013	Cape Town

(4 marks)

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a) Write the SQLstatement required to display the following table giving: the Marathon Name, Date and City for all races taking place in South Africa.

SouthAfricanMarathons		
MarathonName	**MDate**	**City**
Deloitte Pretoria Marathon	03/02/2013	Pretoria
Old Mutual Buffs Marathon	23/02/2013	East London
Nedbank City of Cape Town Marathon	22/09/2013	Cape Town

(4 marks)

b) Write the SQL statement to give the number of finishers for each marathon giving –

(5 marks)

Finishers	
MarathonName	**Finishers**
Deloitte Pretoria Marathon	3
Marathon International de Marrakech	2
Nedbank City of Cape Town Marathon	5
Old Mutual Buffs Marathon	3
Rwanda Challenge Marathon	1
Sahara Marathon	1

c) Write the SQL statement required to display the Marathon Date, Surname, Forename Personal Best and Finish Time for all runners with a finish time better than their previous personal best giving –

NewPB				
MDate	**Surname**	**Forename**	**PersonalBest**	**FinishTime**
03/02/2013	Jones	Andy	03:54:35	03:35:55
03/02/2013	Giroux	Pierre	03:45:40	03:35:45

(11 marks)
(Total 20 marks)

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Question B12.

The processing of a query can be subdivided up into the SQL parsing phase, the execution phase and the fetching phase.

a) Briefly describe the execution and fetching phases.

(4 marks)

b) Briefly describe FOUR of the steps in parsing a SQL query.

(8 marks)

c) Modern database management systems use in-built query optimisers to speed up queries. Describe two other aspects that might affect performance, giving appropriate examples.

(8 marks)

(Total 20 marks)

Question B13.

A bank has its head office in Paris. It has branches all over Europe. Each customer account belongs to one branch only. Currently, the company has one database located in the head office. Customers at branches access this database via a communication network for whatever they need.

One of the relations in this centralised database system is the Account relation where data about the accounts is kept. The attributes of the Account relation are: the account number (AccNo), account type (AccType), the customer's identification (Name), the branch where the account is held, the current balance for the account (balance) and an indicator which tells head office if the publicity (information on updates to regulations, interest rates etc.) for a particular account type for a customer has been sent out. An instance of the account relation is given below:

Acc No	Acc Type	Name	Branch	Balance	Publicity
191688	002	Jones	London	2000	yes
779865	005	Smith	Paris	600	no
158756	002	Green	Paris	8	yes
125467	007	White	Paris	10000	no
124678	005	Black	London	150	yes

a) The bank has decided to move to a distributed database system where each of the sites has its own database. Using the above data explain the concept of horizontal and vertical fragmentation.

(8 marks)

b) Discuss three reasons why replication might be used in a distributed database environment.

(6 marks)

c) What are the problems of introducing replication?

(6 marks)

(Total 20 marks)

End of Examination

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