

### Question 1 (Compulsory)

- (a) What are the *three* schemas in the three schemas architecture of a database? [3]
- (b) State the purpose and *two* tasks involved in the analysis phase of the Database Development process. [3]
- (c) How do you determine that a relation is in Second Normal Form? [2]
- (d) Identify any *five* subsystems of a DBMS. [5]
- (e) State *four* reasons why a transaction might fail in the middle of execution. [4]
- (f) Why might you wish to merge together relations?  
Illustrate your answer by using the following example: [5]

employee1 (id, name, address, contactno)  
employee2 (id, name, address, salary, deptno)

- (g) This question will test your knowledge of the physical and logical properties of the relational data model. Explain your answer by referring to the sample table below:

X	Y	Z
X1	Y1	
X1	Y2	Z2
X2	Y3	Z1
X3	Y4	Z3

Null  
←

Rows  
{

- (i) In the relational model, what is a row called? [1]
- (ii) What is the minimum number of rows in a relation? [1]
- (iii) What is the minimum number of columns in a relation? [1]
- (iv) Rows in a table are unordered, top to bottom. What property does this preserve? [1]
- (v) Based on the sample table above, identify the column which would be suitable for use as a primary key, justify your answer. [3]
- (vi) Column Z contains a null value. What might this null value represent? [1]

*Please turn over.*

## Question 2

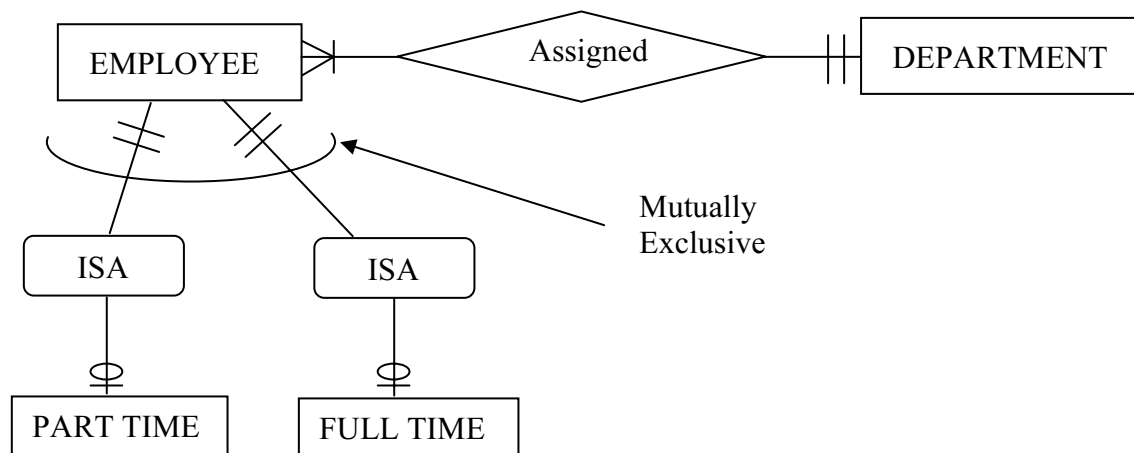
- (a) List *five* problems associated with the file processing approach. [5]
- (b) List and describe *four* benefits of the database approach. [8]
- (c) How does the data stored in a Database differ from the data stored in a Repository? [2]

*Please turn over.*

### Question 3

- (a) (i) Describe the term Logical Database Design. [2]  
(ii) Name *three* types of logical database model. [3]

- (b) Consider the Entity Relationship Diagram below:



- (i) How many Departments can an Employee be assigned to? [1]  
(ii) What is the minimum number of Employees that can be assigned to each Department? [1]  
(iii) Name *one subtype* found in the diagram. [1]  
(iv) Name *one supertype* found in the diagram. [1]  
(v) In the context of this diagram what does the Mutually Exclusive symbol mean? [1]
- (c) Convert the above ER Diagram into an OO diagram. [5]

*Please turn over.*

### Question 4

- (a) Name *three* types of anomaly that normalisation can prevent [3]
- (b) What is a recursive foreign key, and in what type of relationship would you expect to find one? [2]
- (c) Using the normalisation rules, normalise the customer order below. Perform your normalisation in stages working from UNF through to 3NF. [10]

CUSTOMER ORDER			
Order Number: 12345 Order Date: 12/OCT/2003		Customer ID: C1005 Name: New Software Pte Ltd Contact Number: 69090909 Contact Person: Ms Kelly Lin	
Product ID	Product Description	Quantity	Delivery Date
P4545	ACE Accounting Package	5	31/Oct/2003
P5656	Bubble Dragon Game	15	10/Nov/2003
P6767	Hello Kitty Game	20	10/Nov/2003

*Please turn over.*

## Question 5

Consider the following table structure:

### MEMBER

Column name	Data Type	Length
MEMID	NUMBER	5
NAME	CHARACTER	15
REGISTERDATE	DATE	
EXPIRYDATE	DATE	

### VIDEO

Column name	Data Type	Length
VIDEO CODE	CHARACTER	5
DESCRIPTION	CHARACTER	15
BALANCE QTY	NUMBER	5

### SALES

Column name	Data Type	Length
VIDEO_CODE	CHARACTER	5
MEMID	NUMBER	5
SALEDATE	DATE	
PRICE	NUMBER	8,2
QUANTITY	NUMBER	5

- (a) An index is created to provide rapid access to table-based data.
- (i) Write an SQL statement to create an index called MEMID\_IDX on the MEMBER table for the MEMID column. [3]
- (ii) Provide the command to remove the index MEMID\_IDX. [2]
- (b) Write an SQL statement to add the following record to the MEMBER table. [3]
- MEMID: 20002  
NAME: CALLY  
REGISTERDATE: 1<sup>st</sup> October 2003  
EXPIRYDATE: One year after the register date

*Question 5 continues on the following page.  
Please turn over.*

- (c) Write an SQL statement to display the total number of sales for each video code. [3]
- (d) Write an SQL statement to list the video codes and balance quantity for all videos which have a balance quantity less than 5. Sort the output so that those with the least balance quantity are listed first. [4]

**- END OF PAPER -**