UNIVERSITY OF WESTMINSTER⊞

SCHOOL OF COMUPTER SCIENCE AND ENGINEERING
In Class Test SEMESTER 1 2022/23

Module Code: **7BUIS030W**
Module Title: **Data System Concepts and Fundamentals**
Module Leader: **Saumya Reni**
Release Time: **14 December 2022 14:00**
Submission Deadline: **14 December 2022 16:00**

Instructions to Candidates: SOLUTIONS

Please read the instructions below before starting the paper

- Module specific information is provided below by the Module Leader

- This is an individual piece of work so do not collude with others on your answers as this is an academic offence

- Plagiarism detection software will be in use

- Where the University believes that academic misconduct has taken place the University will investigate the case and apply academic penalties as published in Section 10 Academic Misconduct regulations.

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Module Specific Information

This paper has **Three** questions with sub-questions worth 100 marks in total.
Answer **all** questions.
The overall marks awarded for each question are indicated next to the question.
The score of each sub-question is indicated next to the sub-question.
Answers with no working or justification will not gain full marks.
You may use a non-graphical/ nonprogrammable calculator.

Question 1: State whether the following is true or false with justifications

[2 marks each- 1 mark for correct answer and 1 mark for justification; Total 20 marks]

i. In relational database management system, all alternate keys are candidate keys.

    True- A candidate key which is not a primary key is called alternate key

ii. Antivirus protection software is installed in a personal computer as part of data protection.

    False- Antivirus protection software is part of data security measurements

iii. Having the same data entered multiple times in the same table is called Data inconsistency

    False- multiple entry of same data leads to data redundancy

iv. A data processor is a data actor that always determines the purpose and means of the personal data processing

    False- Data controller determines the purpose and means of data processing

v. A record in a database contains the corresponding entry of an attribute in a table

    True- It is each row of the file that contain respective entry of an attribute

vi. A tuple is a column of relation in a relational data structure

    False- It is a row of relation in a data structure

vii. The SQL 'create' command is an example of a Data Definition Language

    True- Create command is used to create an entity in a RDBMS

viii. The data subject is always a third-party who external to the organisation

    False- Data subject can be a part of the organisation at certain instances

ix. The run length encoding (RLE) is an example of lossy compression

    False-It is lossless compression, data can be reconstructed without losing information.

x. A recursive relationship in a conceptual ERD can also be considered as another form of binary relationship

    True- It can be a binary relationship between the same entity

Question 2: Data Protection, Data Actors and Regulatory and Compliance Framework
[Total 36 marks]

A vetting process is being carried out for a certain candidate who is participating in an election procedure to be the leader of the democratic party. The party executive committee is conducting this search internally. Answer the following:

i. Identify the data actors in this scenario, provide justifications and describe their roles.

[18 Marks]

In the example following are the data actors:

*Candidate is the **data subject** as it is his personal data being used.   – 2 Marks*

A data subject is any person whose personal data is being collected, held or processed.

- *Data subject has the right to access data about them.   – 2 Marks*

*The democratic party is the **data controller** as it determines the purpose for which the data is being processed.   – 2 Marks*

A data controller determines the purpose and means of the personal data processing.

–2 Marks

- *Data controllers can be a natural person, a legal person, a public authority, agency or other.*
- *Data controllers are in charge of the processing of personal data belonging to data subjects.*
- *Data controllers can act alone or jointly with others*

– 3 Marks

*The executive committee of the party is the **data processors** which process the personal data as per the company's instructions.   – 2 Marks*

A data processor is the person processing the personal data of the data subjects. –2 Marks

- *Data processor can be an individual, legal person, a corporation, a public authority, agency or any other body which processes personal data.*
- *Data processors acts on behalf of data controllers*
- *Data processors act in accordance with the instructions of data controllers.*
- *The data processor is usually a third-party external to the organisation*

– 3 Marks

ii. Can the candidate refuse to provide his personal details? Justify how the candidate can steer this process based on at least four fundamental principles of data protection.

[6 Marks]

Candidate cannot refuse to provide his personal details since the vetting process is legally bound. –2 marks

However, based on the fundamental principles of data protection, the candidate can always insist that:

- *His personal data should be processed fairly and lawfully,*
- *The personal data shall be obtained only for specified, lawful purposes, and shall not be further processed in any manner incompatible with that purpose or those purposes,*
- *Personal data shall be adequate, relevant and not excessive in relation to the purpose or purposes for which they are processed.*

- *Personal data processed for any purpose or purposes shall not be kept for longer than is necessary for that purpose or those purposes.*

1 mark each for four of the above statements

iii. The party uses *BS10012:2017* regulations and compliance frameworks to maintain the data protection involving their potential members. State what this regulation stands for and explain the significance of these regulations? [4 Marks]

BS10012:2017 is the British standard that specifies the requirements for a personal information management system (PIMS). Marks Organisations that have not developed their own privacy compliance frameworks can use a standardised framework such as BS10012:2017 to ease their path to General Data Protection Regulation (GDPR) compliance. – 2 Marks

These data regulations are in place to maintain data protection. Compliance frameworks provides a structure to manage the personal data an organisation can use. Organisations can have their own privacy compliance frameworks. – 2 Marks

iv. The party website was hacked during the campaign and important information on the candidates were leaked. Identify what type of data security issue does this involve and describe its nature. [4 Marks]

*This is a **Cyber-attack** because it targeted an organisations computer network.* —2 Marks

Cyber-attack is any type of offensive activity that targets computer information systems, infrastructures, computer networks, or personal computer devices. —2 Marks

v. State four data security measurements the party can take to avoid future issues. [4 Marks]

The data security measurements that the party can use are:
- *Password protection*
- *Antivirus Software*
- *Data encryption*
- *Firewall protection*

--1 mark each for each point

Question 3: Data life cycle   [Total 44 marks]

Part 1: Conceptual and Logical ERDs

The conceptual ERD shown in the following Figure 1 is for a bookstore which sells copies of published books to customers.
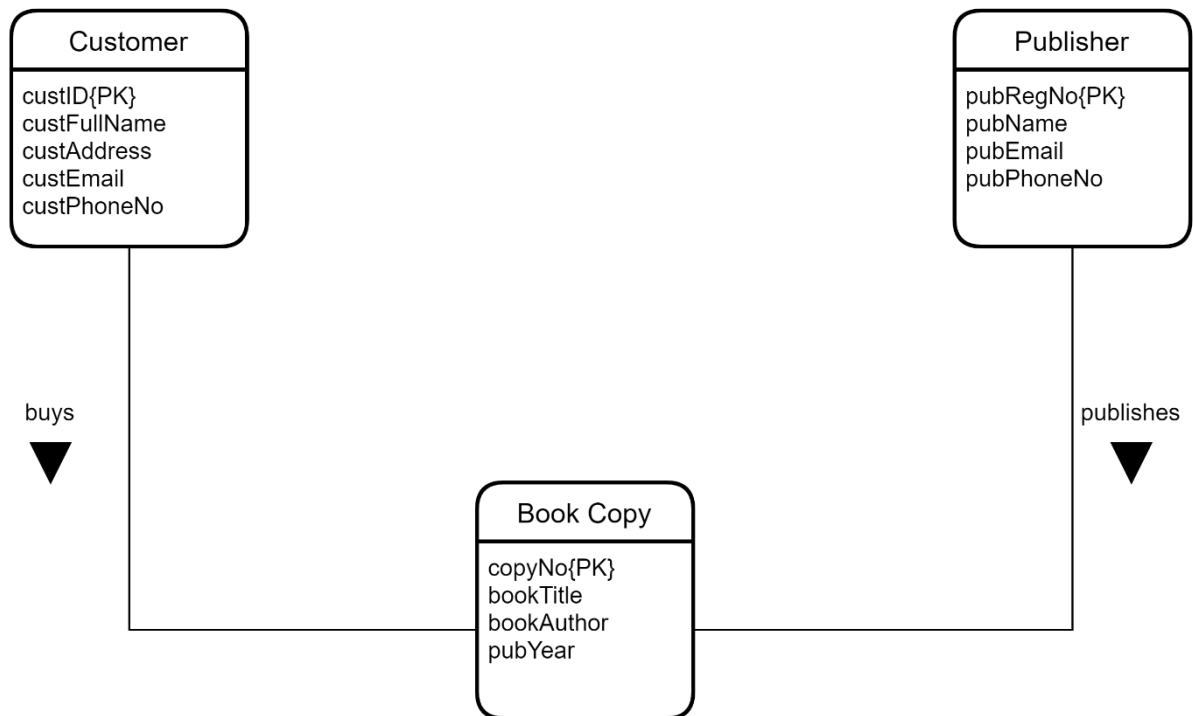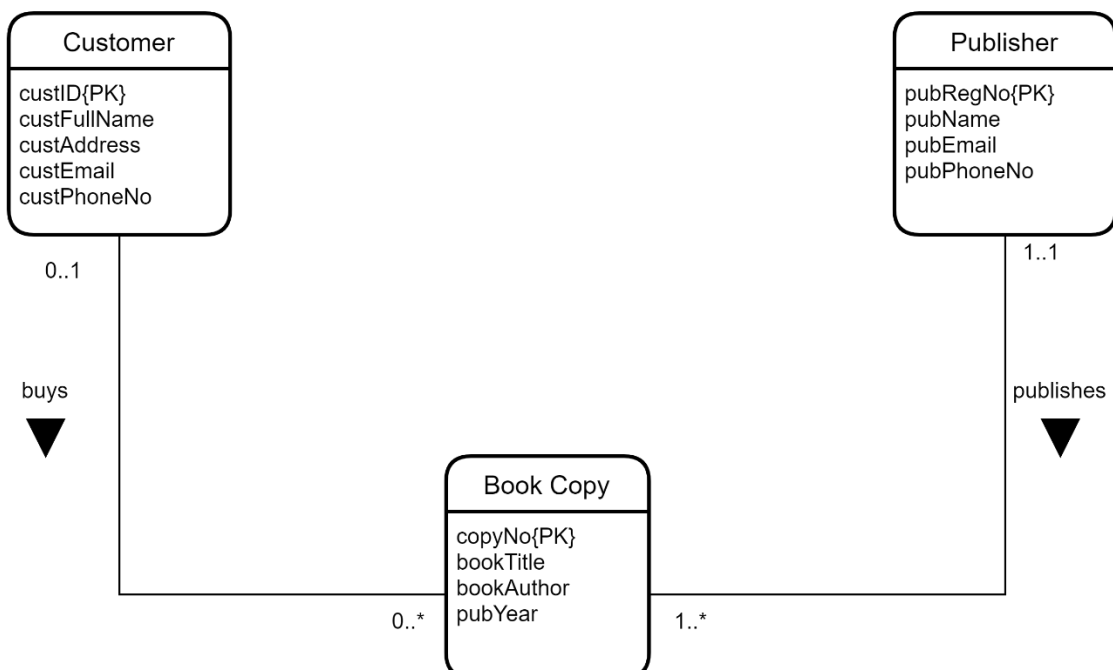

Figure 1

i.   Complete the above ERD with multiplicities of relationship between each entity. [4 Marks]

Multiplicity between customer and book copy – 2 Marks

Multiplicity between book copy and publisher—2 Marks

ii. Identify the strong and weak entities in the above ERD and justify your answer. **[4 Marks]**

In this ERD, Customer and Publisher are strong entities. Both are entities with an existence that does not depend on the existence of any other entity in a schema. *– 2 Marks*

Book copy is the weak entity as it depends on the strong entity for its existence. Book copy does not exist if the publisher doesn't publish it. *–2 Marks*
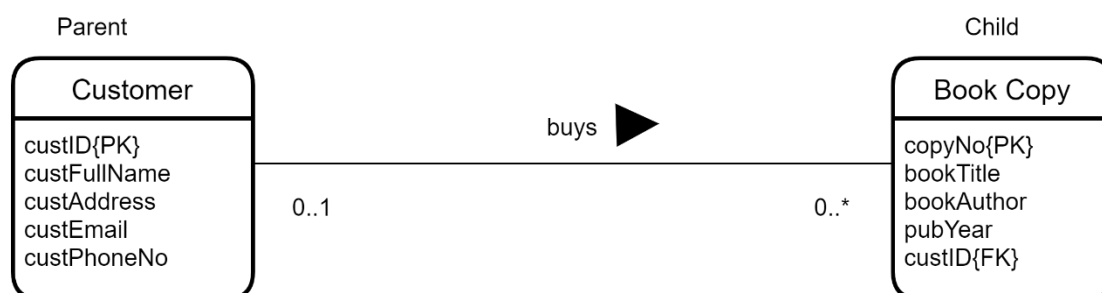
iii. Explain in detail the multiplicities of the relationship 'publishes' (between the entities publisher and book copy) by providing 4 meaningful statements. Also provide adequate justifications to support each statement. **[8 Marks]**

The multiplicity of this relationship can be established as follows:
- *One publisher publishes at least one book –participation*
- *One publisher publishes many books-- cardinality*
- *One copy of book is published by at least one publisher –participation*
- *One copy of book is published by no more than one publisher-- cardinality*
  2 marks each for each statement

iv. Map the relationship 'buys' (between Customer and Book Copy) into a full logical data model. To do this, resolve the relationship between the entities and derive the associated relation (i.e., tables) with all the attributes, primary keys and foreign keys. You should also explain the mapping rules associated with this relationship, identifying the parent and the child tables.

[7 Marks]

- *This is a one-to-many relationship.*
- *To map a one-to-many relationship to its logical ERD, two tables are created.*
- *The table at the one side is the parent and the table at the many side is the child. Hence Customer is the parent and Book Copy is the child*
- *The primary key of the parent will appear as the foreign key of the child ---1 mark each for each of the above sentence*
  The logical ERD is as shown below:

Parent | | Child

Customer		Book Copy
custID{PK} custFullName custAddress custEmail custPhoneNo	buys ▶ 0..1 0..*	copyNo{PK} bookTitle bookAuthor pubYear custID{FK}

- *2 marks for the logical ERD indicating the parent table and the child table.*
- *1 mark for correctly providing the primary key of the parent table as the foreign key of the child table*

Part 2: Query Language

v.   Write an SQL query to create all the three entities into the Book store data base. Please carefully include all the foreign keys and constraint while creating the table.   [21 Marks]

```
CREATE TABLE Customer
(custID              INT (6),
custFullName         VARCHAR(50) NOT NULL,
custAddress          VARCHAR(50) NOT NULL,
custEmail            VARCHAR(50) NOT NULL,
custPhoneNo          VARCHAR(20),
CONSTRAINT           c_cid_pk PRIMARY KEY (custID)
);
                     -- 1 mark each for each line of code, total 6 Marks
CREATE TABLE Publisher
(pubRegNo         INT (6),
pubName         VARCHAR(50) NOT NULL,
pubEmail         VARCHAR(50) NOT NULL,
pubPhoneNo         VARCHAR(20),
CONSTRAINT          p_pregno_pk PRIMARY KEY (pubRegNo)
);
                     -- 1 mark each for each line of code, total 5 Marks
CREATE TABLE Book Copy

(copyNo          INT(10),
bookTitle         VARCHAR(50) NOT NULL,
bookAuthor        VARCHAR(50) NOT NULL,
pubYear          DATE NOT NULL ,
custID           INT (6),
pubRegNo          INT (6), NOT NULL,
CONSTRAINT          bc_cno_pk PRIMARY KEY (copyNo),
CONSTRAINT          bc_cid_fk FOREIGN KEY (custID)
REFERENCES  Customer(custID),
CONSTRAINT          bc_pregno_fk FOREIGN KEY (pubRegNo)
REFERENCES  Publisher (pubRegNo);
-- 1 mark each for each line of code,1 mark for correctly identifying
that custID can be null due to participation pubRegno must be not null;
total 10 Marks
```

END OF PAPER