UNIVERSITY OF WESTMINSTER⌗

SCHOOL OF COMUPTER SCEINCE AND ENGINEERING
In Class Test SEMESTER 1 2021/22

Module Code:	**7BUIS030W**
Module Title:	**Data System Concepts and Fundamentals**
Module Leader:	**Saumya Reni**
Release Time:	**Tuesday 16 December 2021 14:00**
Submission Deadline:	**Tuesday 16 December 2021 17:00**

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 <u>Section 10 Academic Misconduct regulations.</u>

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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   [1 mark each; Total 10 marks]

i. Having the same data entered multiple times in the same table is called Data redundancy
    True
ii. A data subject determines the purpose and means of the personal data processing
    False
iii. A record in a database contains columns used to capture attributes in a table
    False
iv. A tuple is a row of relation in a relational data structure
    True
v. The SQL select command is an example of a Data Definition Language
    False
vi. Data back up and system update are examples of data protection
    False
vii. The data processor is always a third party external to the organisation
    False
viii. Big data and Data mining procedures are large scale data extraction tools
    True
ix. In DBMS, a primary key is always a candidate key but all candidate keys are not primary key.
    True
x. A dictionary is a physical database
    True

Question 2: Data Protection, Data Actors and Regulatory and Compliance Framework
[Total 45 marks]

i. State any four fundamental principles of data protection.   [4 Marks]
    Data Protection deals with personal data and relates to the following fundamental principles:
    - *Personal data shall be processed fairly and lawfully,*
    - *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 shall be accurate and, where necessary, kept up to date.*
    - *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 any four of the above statements

ii. What are data actors? Provide their names   [4 Marks]

    Data actors are the various parties involved in data protection.   – 1 Mark
    The data actors are:
    - *data subjects*
    - *data controllers*
    - *data processors*   *– 3 Marks*

iii. Alex has been recently offered a job in an Asset management company as Data Analyst. The company has appointed the Bluespert agency to conduct background check on Alex before he starts his new job. Identify the data actors in this scenario, provide justifications and describe their roles.   [16 Marks]

In the example following are the data actors:
*Alex 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 Asset management company 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.
                                                                –1 Mark

- *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 agency Bluespert 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. –1 Mark

- *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

iv. The company uses regulations and compliance frameworks to maintain the Data protection involving their potential employees like Alex. What are the significance of these regulations?   [4 Marks]

Data regulations are in place to maintain data protection. For example, the European Union has issued a pan-European data protection law called General Data Protection Regulation (GDPR) in 2018. GDPR addresses the transfer of personal data outside the EU and EEA areas. The primary aim is to let individuals control their personal data
                                                                --2 Marks

Compliance frameworks provide a structure to manage the personal data an organisation can use. Organisations can have their own have privacy compliance frameworks . Organizations should obtain certification to national and international standards to demonstrate to regulators that due diligence and compliance efforts have been made. Organisations that have not developed their own privacy compliance frameworks can use a standardised framework to ease their path to GDPR compliance. For example, BS10012:2017 is the British standard that specifies the requirements for a personal information management system (PIMS)   – 2 Marks

v. The company has established data security measures such as computing device protection using antivirus software and firewall. How do these Data security actions differ from data protection frameworks? [5 Marks]

Data Security is not data protection, and neither is it a substitute for data protection —1 Mark

- *Data protection deals with personal data while data security maintains the protection of databases and systems*
- *Data protections works based on fundamental principles of personal data management whereas data security is mainly a technical and a procedural issue*
- *Data protection is maintained using regulations and compliance frameworks while data security protects digital data that are stored and organised in the database from unwanted actions, unauthorised users or destruction.*
- *Data protection compliance audits are mainly legal work whereas data security audits do not have a legal component*

--1 Mark each for each statement

xi. State the two types of data security issues. [4 Marks]

Cyber-attack which is targeted at an organisation's computer network

—2 Marks

Data Breach which is the intentional or unintentional release of private information to an untrusted environment. — 2 Marks

xii. Describe what type of data security issues will the following incidents pose:
a) A university network being hacked and all the students were sent spam emails from staff email address. [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

b) A mobile phone being stolen, and the personal photos released [4 Marks]

This is a Data Breach because an intentional release of private information took place. —2 Marks

Data breach is the intentional or unintentional release of secure or private/confidential information to an untrusted environment. This includes unintentional information disclosure, data leak, information leakage and also data spill —2 Marks

Question 3: Data life cycle **[Total 45 marks]**

Part 1: Conceptual and Logical ERDs

The conceptual ERD shown in Figure 1 is for an art gallery which commissions artwork created by artists for customers.
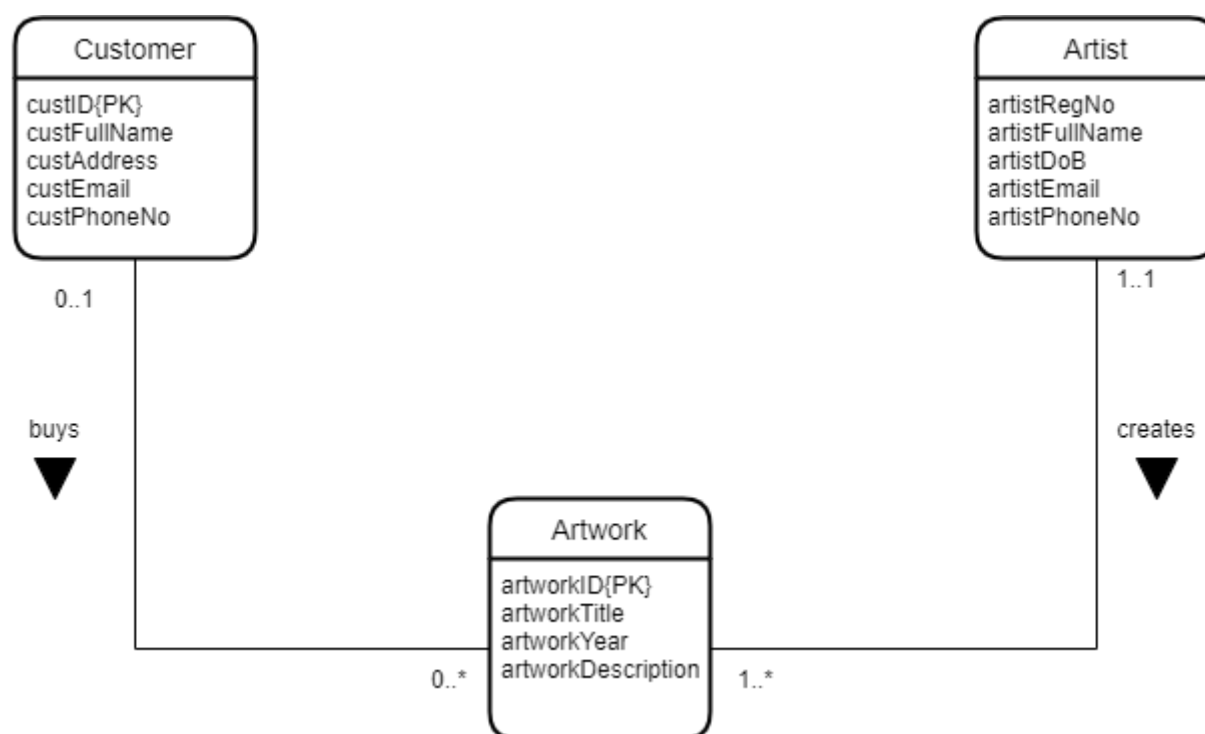

Figure 1

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

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

Artwork is the weak entity as it depends on the strong entity for its existence. Artwork does not exist if an artist doesn't create it. *–2 Marks*

ii. Explain in detail the multiplicities of the relationship 'creates' (between the entities Artist and Artwork) by providing 4 meaningful statements. Also provide adequate justification to support each statement. [8 Marks]

The multiplicity of this relationship can be established as follows:
- *One artist creates at least one artwork –participation*
- *One artist creates many artworks-- cardinality*
- *One artwork is created by at least one artist –participation*
- *One artwork is created by no more than one artist-- cardinality*
  2 marks each for each statement

iii. Map the relationship 'buys' (between Customer and Artwork) 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 Artwork 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:

- *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

iv.   Write an SQL query to create all the three entities into the Art Gallery database. 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 on identifying the correct data type for each attribute
and addressing the primary key. Total 6 Marks

CREATE TABLE Artist
(artistRegNo         INT (6),
artistFullName       VARCHAR(50) NOT NULL,
artistDoB            DATE NOT NULL,
artistEmail          VARCHAR(50) NOT NULL,
artistPhoneNo        VARCHAR(20),
CONSTRAINT           a_aregno_pk PRIMARY KEY (artistRegNo)
);
-- 1 Mark each on identifying the correct data type for each attribute
and addressing the primary key. Total 6 Marks
```

```
(artworkID            INT(10),
artworkTitle         VARCHAR(50) NOT NULL,
artworkYear          DATE NOT NULL ,
artworkDescription   VARCHAR(50),
CONSTRAINT           aw_awid_pk PRIMARY KEY (artworkID),
CONSTRAINT           aw_cid_fk FOREIGN KEY (custID)
REFERENCES  Customer(custID),
CONSTRAINT           aw_aregno_fk FOREIGN KEY (artistRegNo)
REFERENCES  Artist (artistRegNo);
-- 1 Mark each on identifying the correct data type for each attribute
and addressing the primary key. 2 Marks each for addressing and
referencing the 2 Foreign keys. Total 9 Marks
```

v.   Write a SQL query to title and year of release of all the artwork created in the year 2020 and has the word 'dew' or 'autumn' in their titles.   [5 Marks]

```
SELECT artworkTitle, artworkYear                        -- 1 Mark
FROM Artwork                                            -- 1 Mark
WHERE (artworkYear LIKE %2020%)                          -- 1 Mark
AND (artworkTitle LIKE '%dew%' or artworkTitle LIKE '%autumn%'); -- 2
Marks
```

END OF PAPER