UNIVERSITY
OF
JOHANNESBURG

MEMO

FACULTY OF SCIENCE

ACADEMY OF COMPUTER SCIENCE & SOFTWARE ENGINEERING

MODULE   IFM2A10/IFM02A2

                    INFORMATICS 2A

CAMPUS   APK

FINAL SUMMATIVE   10 JUNE 2020 08:30
ASSESSMENT

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INTERNAL MODERATOR   MR FF BLAUW

DURATION   120 minutes   MARKS   100

Memo

Question 1

Airlines worldwide are facing a challenging time during the COVID-19 pandemic. Due to the suspension of air travel, airlines require passengers to apply for refunds, reschedule bookings or convert their bookings to vouchers. EagleWings Airlines is a local airline that has contacted you to help them develop a new database to keep track of their employees, flights, bookings and passengers during this time.
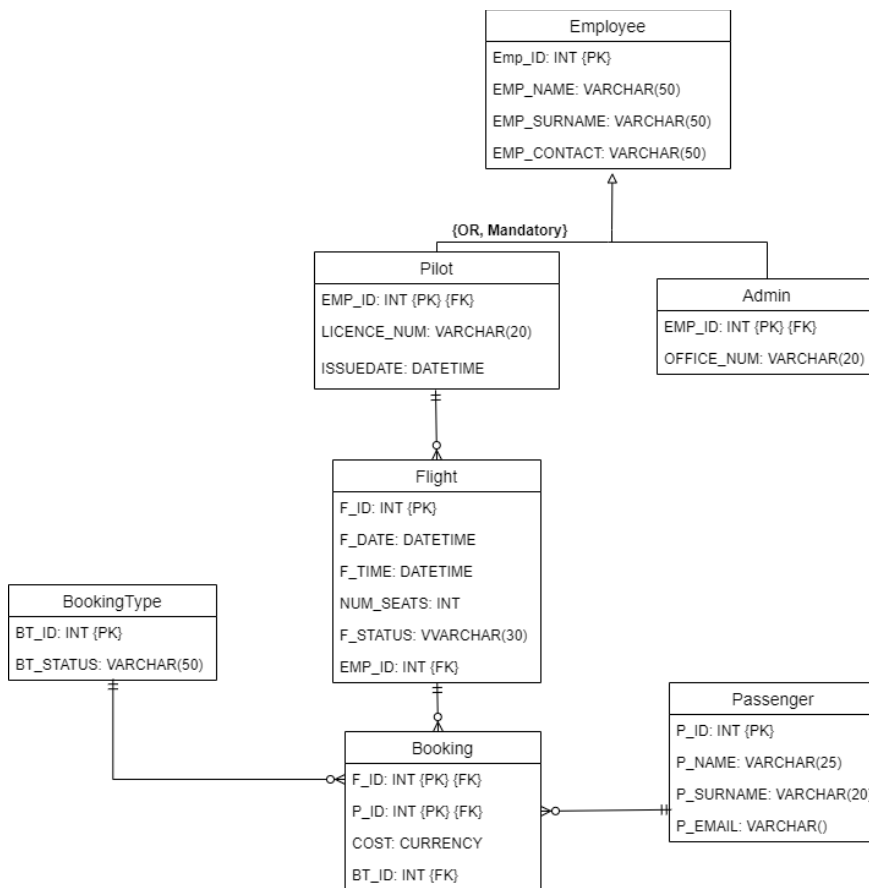
The following details are provided to you:

- EagleWings has two types of employees, namely pilots and admins.
- Each employee must either be a pilot or an admin, but not both.
- EagleWing pilots are assigned zero to several flights per month.
- Each flight has a date, time, number of available seats and a flight status.
- The airline needs the ID, Name, Surname and Contact number of every employee.
- Pilots have their pilot licence number and date of issue.
- An admin has an office number.

A flight may contain many passengers and a passenger can have bookings for multiple flights. The airline would like to keep track of at least each passenger's name, surname and email. The total cost of every booking is also calculated and stored.

Furthermore, there is a need for keeping track of booking types, which allows for bookings to have one of the following assigned statuses: "Unassigned", "Reschedule", "Refund" or "Voucher".

1.1) Draw an Extended Entity Relationship Diagram (EERD) using the information [25]
provided above. Include all attributes and their datatypes.

Employee

Emp_ID: INT {PK}
EMP_NAME: VARCHAR(50)
EMP_SURNAME: VARCHAR(50)
EMP_CONTACT: VARCHAR(50)

{OR, Mandatory}

Pilot

EMP_ID: INT {PK} {FK}
LICENCE_NUM: VARCHAR(20)
ISSUEDATE: DATETIME

Admin

EMP_ID: INT {PK} {FK}
OFFICE_NUM: VARCHAR(20)

Flight

F_ID: INT {PK}
F_DATE: DATETIME
F_TIME: DATETIME
NUM_SEATS: INT
F_STATUS: VVARCHAR(30)
EMP_ID: INT {FK}

BookingType

BT_ID: INT {PK}
BT_STATUS: VARCHAR(50)

Booking

F_ID: INT {PK} {FK}
P_ID: INT {PK} {FK}
COST: CURRENCY
BT_ID: INT {FK}

Passenger

P_ID: INT {PK}
P_NAME: VARCHAR(25)
P_SURNAME: VARCHAR(20)
P_EMAIL: VARCHAR()

Marks total	Breakdown
Entities – 5 marks	Employee (1) Admin & Pilot (1) Flight (1) BookingType (1) Passenger (1)
Attributes – 5 marks	Employee EMP_CONTACT (1) Pilot LICENCE_NUM (1) Flight F_STATUS (1) BookingType BT_STATUS (1) Passenger P_NAME (1)
Keys – 5 marks	Bridging table keys (2) Foreign key EMP_ID in Flight and Pilot tables (2) Primary keys for all tables (1)
Datatypes – 5 marks	Admin OFFICE_NUM: VARCHAR (1) Flight F_DATE: DATETIME (1) Flight F_TIME: DATETIME (1) Flight NUM_SEATS: INT (1) Booking COST: CURRENCY (1)
Relationships – 5 marks	Inheritance with constraints OR, MANDATORY (2) Bridging table booking 1 to many relationships (2) Pilot – Flight relationship (1)

Question 2	
2.1) Provide an example of a business rule that reveals a relationship from the above scenario in Question 1. Identify which type of relationship this is.	(2)
2.1) Any valid example from the scenario. Students may identify a one-to-many relationship or a many-to-many relationship for this scenario.	
2.2) Select one of the entities from your EERD from Question 1. State what the degree would be of this entity's implemented table and give a reason for your answer.	(2)
2.2) Any correct answer based on the student's EERD. Eg. The "Flight" entity has a degree of 4 because it has four attributes (column values)	
2.3) Write out the relational schema of one of your EERD relations from Question 1 which has at least one foreign key.	(3)
2.3) Any appropriate relation from the EERD. Eg: FLIGHT {F_ID, F_DATE, F_TIME, EMP_ID*} One mark for the Entity Name One mark for the underlined Primary Key One mark for the asterisk for the Foreign Key	
2.4) Read the following scenario: *An organisation that provides cooking classes to students needs your help to store their data in a database.* ***Each student can enrol in multiple cooking classes and each cooking class can have multiple students enrolled.*** What kind of relationship is described by the underlined sentence? Explain how this scenario is implemented in a Database Management System. Refer to the handling of keys in this scenario.	(4)
Many-to-many relationship – 1 Mark. Bridging table – 1 Mark. Explanation about the role of foreign keys in such a table: They may refer to composite keys. – 2 Marks	
2.5) Discuss which properties of a relation are violated by the following table structure. In your answer, state any two properties and explain how each property is being violated: <table><tr><th>Event</th><th>Participants & Time</th></tr><tr><td>Spring Run</td><td>Nick Dube 1H02 Allie Smith 1H15</td></tr><tr><td>Walk the Talk</td><td>Thabo Buchan 0H40 Nelo Camillo 1H00</td></tr><tr><td>Spring Run</td><td>Kelly Minnick 1H13</td></tr></table>	(4)
1.) Each table row (tuple) represents a single entity occurrence within the entity set. There are multiple rows that contain multiple entity occurrences.	

2.) Each table column represents an attribute, and each column has a distinct name. The second column does not represent distinct attributes.

3.) Each cell or column/row intersection should contain only an atomic value – a single data value. The table has cells which contain multiple values for one cell.

4.) All values in a column must conform to the same data format. Column two contains data that does not conform to the same data format.

5.) Each column has a specific range of values known as the attribute domain. Column two has no clear range of values.

6.) Each table must have an attribute or a combination of attributes that uniquely identifies each row.

Any two of the above: 1 Mark per property, 1 Mark per explanation. Total: 4 Marks

[15]

Question 3

YOHOS is a company that owns multiple other companies. To keep track of salaries and staff records all information is kept in one excel sheet as can been seen below. The company places a lot of trust in their employees and encourage them to work in multiple stores. YOHOS is responsible for paying every employees salary and each store sends their information to YOHOS HQ for processing.

Store_Name	Store_location	Emp_Name	Emp_Surname	Position	Hourly_rate	Hours_Worked
Checkers	Pretoria	John	Mason	Cashier	100.00	20
Pete's Pizza	Johannesburg	Mary	Bauer	General Manager	2000.05	40
Tower City	Soweto	Tandi	Cooper	Sales Rep	400.00	60
Shoe Heaven	Soweto	Sally	Le	Manager	500.50	42
Handy Hardware	Johannesburg	Phillip	Cobb	Sales Rep	400.00	23
Smellies	Pretoria	Sally	Le	Sales Rep	400.00	24
Nike Brand Store	Johannesburg	Nikki	Booth	Sales Rep	400.00	26

3.1	In which normal form is the above table? Motivate your answer.	(2)

Unnormalized, there is no primary key indication

OR

First normal form, (if they assume a PK is present)

3.2	What would be a preferable primary key base on the given table?	(2)

{Store_Name, Emp_Name, Position}

OR

{Store_Name, Emp_Name}

3.3	Provide all the dependencies of the given table.	(6)

Store_name -> Store_Location

Emp_Name -> Emp_Surname

Store_Name, Emp_Name -> Position, hourly_rate, hours_worked

Position -> hourly_rate

3.4	Convert the table into the second normal form.	(9)

Store(Store_name, Store_Location)

Employee(Emp_Name, Emp_Surname)

Wages(Store_Name, Emp_Name, Position, hourly_rate, hours_worked)

3.5	Convert the table into the third normal form.	(3)

Store(Store_name, Store_Location)

Employee(Emp_Name, Emp_Surname)

Wages(Store_Name, Emp_Name, Position, hours_worked)

Posts(Position, hourly_rate)

3.6	Provide three(3) suggestions on how to improve the design of the table after they have been restructured into third normal form.	(3)

Store -> needs surrogate key

Employee -> needs surrogate key

Wages -> needs surrogate key

Posts -> needs surrogate key

		[25]

Question 4

CovidTours is a travel agency that for their high service standards and the experiences they provide to their clients. In a bid to improve their handling of client bookings for the different tours they offer, they have hired you to develop the information system that will be used.

They have brought you in to specifically help them design the database they will be using. As part of your design job, the CovidTours managers asked you to provide an Entity Relationship Diagram to show the structure of the database.

They would like you to enable the database to keep track of the tours they offer. Details such as the name of the tour, description, location, and prices are especially important and must be handled.

The managers also want to keep track of the customers that use their system. The designed database should be able to store details on all customers such as first name, last name, address, date of birth and email address.

Each customer can make multiple bookings on the system. Each booking can only be made by one customer. To improve their management practices, CovidTours would like to keep information on each of the booking options of their customers. Information on bookings incudes the status of the booking, the date the booking was made, and the cost of the booking.
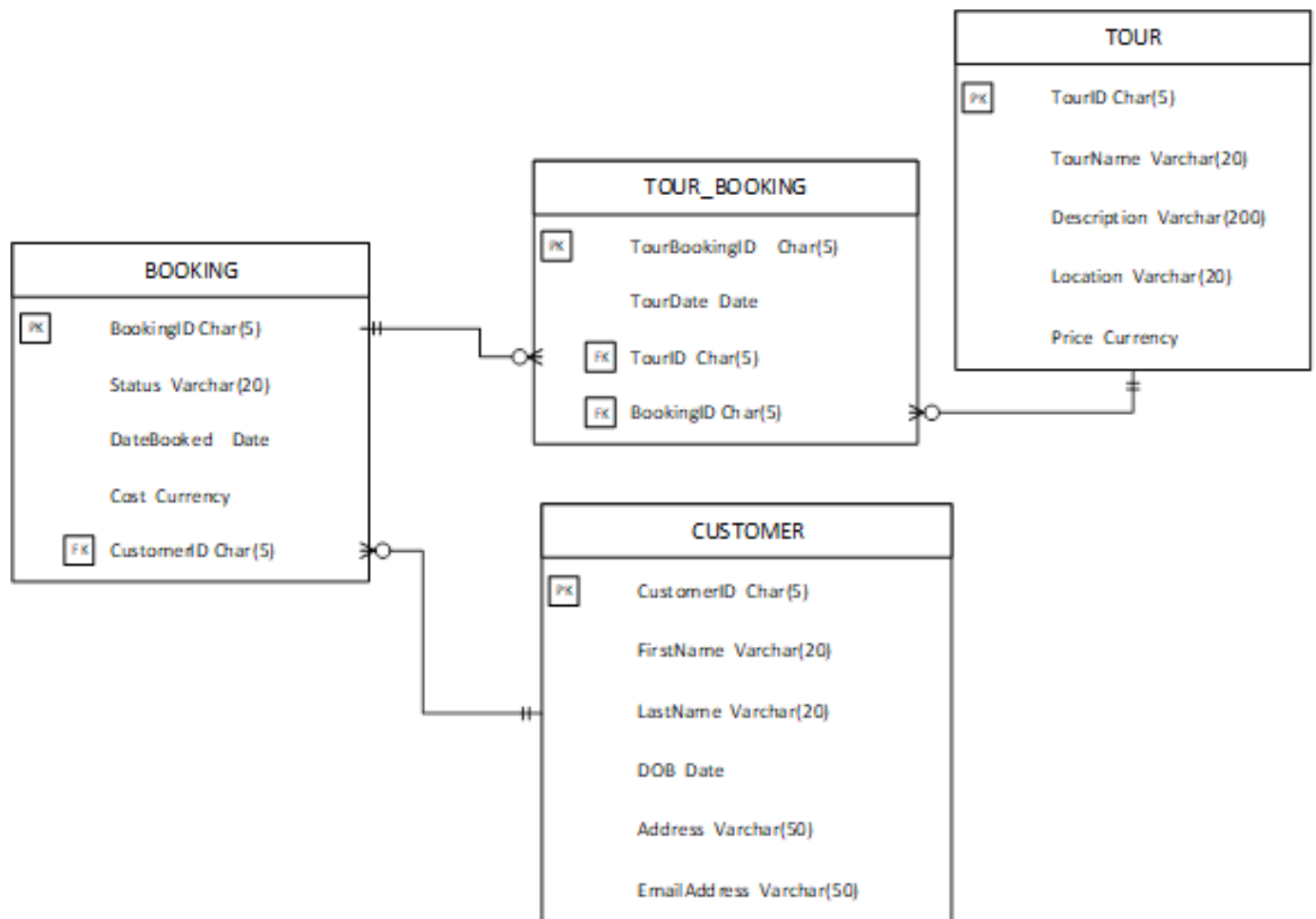
Each of the bookings that can be made by customers can also be linked to the tours that are offered by CovidTours since such tours can be offered as part of a package for a booking. Each booking can have many tours as part of its package, just like each of the tours that are offered can be included in the different bookings that CovidTours gets. The tour's date must be kept to avoid clashes in the schedule.

Given the information above, draw an ER Diagram showing the following:

- Entities,
- Attributes,
- All key attributes,
- Data types for each attribute, and
- All relationships between the entities.

NB: You may use one of the standardised ERD notations.

[15]

TOUR

PK	TourID Char(5)
	TourName Varchar(20)
	Description Varchar(200)
	Location Varchar(20)
	Price Currency

TOUR_BOOKING

PK	TourBookingID Char(5)
	TourDate Date
FK	TourID Char(5)
FK	BookingID Char(5)

BOOKING

PK	BookingID Char(5)
	Status Varchar(20)
	DateBooked Date
	Cost Currency
FK	CustomerID Char(5)

CUSTOMER

PK	CustomerID Char(5)
	FirstName Varchar(20)
	LastName Varchar(20)
	DOB Date
	Address Varchar(50)
	EmailAddress Varchar(50)

3 Marks per table

1x Name

1x PK & FK

1x Attributes

1 Mark per correct relationship [3 marks max]

Question 5

5.1	Provide the SQL queries to create the tables designed in Question 4.	(8)

CREATE TABLE CUSTOMER(…..);

CREATE TABLE BOOKING(…..);

CREATE TABLE TOUR_BOOKING(…..);

CREATE TABLE TOUR(…..);

Based on the tables they provided in Q4

1x mark for each table [max 4 marks]

1x mark for correct data types (marked per table) [max 4 marks]

5.2	Provide an example of an insert statement for any one of the tables in 5.1.	(2)

INSERT INTO {table name here} [1]

Values (….) [1]

– if they use autoincrement and they don't give it a value then they have to list the columns

INSERT INTO {table name here} (Col1, ….) [1]

Values (….) [1]

5.3	Provide the SQL statement to display the name of each customer and the name of the tours they are currently booked for. Make use of an Inner Join.	(4)

SELECT FirstName, TourName FROM

Customer inner join booking Customer.CustomerID=Booking.CustomerID

inner join Tour_booking ON Booking.BookingID=Tour_Booking.BookingID

inner join Tour ON Tour_Booking.TourID=Tour.TourID

5.4	Provide the SQL statement to count the number of customers booked for each tour	(4)

SELECT TourName, Count(Tour_Boooking].BookingID) FROM

Booking inner join Tour_booking ON Booking.BookingID=Tour_Booking.BookingID

GROUP BY TourName

5.5	Provide the SQL statement to remove all customers born before 20 May 2000.	(2)

DELETE FROM Customer WHERE DOB < #2000-05-20#

		[20]

TOTAL 100 MARKS

THE END 😊