

INFS 3770 – Final Exam Instructions

Fall 2020

Download and Review the data in the fall20Exam.xlsx Excel document and complete the exam components defined in Parts 1 – 3 below. Download the Exam Answer Sheet and Record your answers in the space provided, unless otherwise instructed. The following narrative will help you understand the use case for the data. (Note: the Excel file is not part of the submission. It is a working document for you.)

The WeFlyU is an small charter airline company in Toledo, OH. It provides charter services to local companies. WeFlyU would like a database to better track its planes, pilots, customers and charters.

WeFlyU currently keeps its data in an Excel file – but they are finding that the data is not usable in this form. They would like you to design a set of tables that adheres to best practices and will allow them to better utilize the data in queries and reports.

For each **Customer**, WeFlyU wants to track the customer name (*custName*), the address (*custAddr*), the contact person (*custContact*) and the contact person's phone number (*custPhone*).

For each **Pilot**, WeFlyU wants to store info about the Pilot's SSN (*pilotSSN*), Pilot's Name (*pilotName*), Pilot's license renewal date (*pilotLicRenew*), and their date of hire (*pilotHireDate*).

For each **Aircraft**, WeFlyU wants to store info about the aircraft Call sign (*aircraftSign*), the aircraft type (*aircraftType*) and the aircraft seating capacity (*aircraftCapacity*)

For each **Charter**, WeFlyU wants to record the charter number (*charter#*), the charter date (*charterDate*), the charter's destination (*charterDest*), the estimated miles (*charterMiles*), and the charter's fee (*charterFee*).

WeFlyU identified the following business rules for you:

Customers purchase one to many charters and each charter is purchased by one and only one customer.

Each charter is serviced by one and only one aircraft. An aircraft is assigned to zero or many charters.

Each charter has one and only one pilot to fulfill the charter arrangements. A pilot flies zero to many charters.

Part 1 – 10 Points: Normalization. Using the functional dependencies listed below, determine the NF of the table presented in the Fall20Exam.xlsx Excel file. Charter# serves as the Primary Key for the table of data. You can safely assume that each column in the Excel data is directly or indirectly determined by the charter#. Additionally, these Functional Dependencies are found in the data:

Charter# → charterDate, charterDest, charterMiles, charterFee, custName, aircraftSign, pilotSSN

custName → custAddr, custContact, custPhone

AircraftSign → aircraftType, aircraftCapacity

pilotSSN → pilotName, pilotLicRenew, pilotHireDate

Answer the follow questions and **Record your answers in Part 1 section of the Exam Answer Sheet.**

- The table is susceptible to modification anomalies. Provide specific examples of insertion, deletion, and update anomalies one might encounter in this data (one of each).
- Analyze the table structure and determine its state of normalization. Present your rationale and conclusion using the PRECISE methodology demonstrated in the class lecture.
- Normalize the data to 3NF. Present your solution in a set of **relational schemas** that meet 3NF requirements.

Part 2 – 10 Points: Draw an ERD to model the normalized database derived from Part 1. **Insert a screen shot of your ERD in the Part 2 Section of the Exam Answer Sheet.** Also upload a copy of the .pdf version of the Visio drawing (named yourLastName_Part2.pdf). **Do not submit the .vsdx file!**

Use good modeling techniques: relationship names, crow's foot notation with min and max cardinalities displayed, PK's and FK's identified, as appropriate for the model. Ensure that your ERD reflects good design and is normalized, by design.

Use the concepts you have learned throughout the semester to design a database for WeFlyU. Make "best practices" choices for primary key selections. Use good design techniques as you consider the attributes needed for each table. Be sure to use **simple** versus composite attributes **and single value** versus multi-value attributes. Consider what fields should be required to have a value and carefully analyze the business rules to understand the relationship types, direction and connectivities.

Once designed, **use Microsoft Visio** to draw the ER diagram that can be used to communicate the design to WeFlyU and a DBA.

Your ERD must include entities, attributes, relationships (descriptively named), primary keys, foreign keys, and reflect the proper connectivities and cardinalities. Identify the strong and weak relationships and entities by properly setting those properties in Visio. You **MUST** use Crow's Foot notation for your model.

Change the Design Settings in Visio to select the **Simple Design** and make sure that your crow's foot symbols are large enough to see!

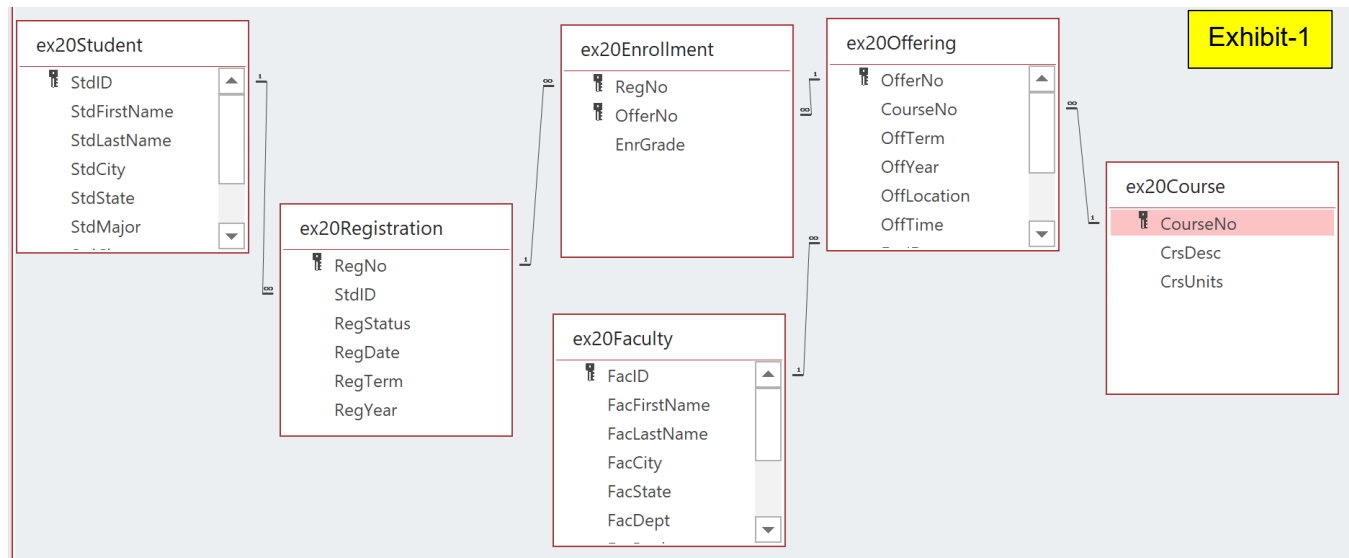
Part 3 - 10 points: Create Tables and Insert Data. Implement the tables of your database design by writing a Script file that includes the CREATE TABLE statements to create the tables and their relationships.

Also include the INSERT INTO statements to insert the data provided in the Excel document for charters 1001-1006. Be sure to insert all related data into the corresponding tables for these charters.

Include a SELECT statement for each table to generate a result set showing all rows and columns of data in each of your tables. Include the P/L commands to format the output of each result set in your script file.

Execute your script file and direct and capture the script output to a pool file. **Name your files using the typical convention: yourLastName_Script.sql, and yourLastName_Spool.txt. You will submit these files with your Exam Answer Sheet.**

Part 4 – 30 points: SQL Queries. Download the Fall20examScript.sql script file from Blackboard and execute it in SQL Developer to load the data needed to complete this portion of the exam. Then, read each problem statement and write the SQL necessary to produce the information requested. Points are awarded, as indicated. Partial Credit will be awarded, so do what you can! Refer to the "sample" result sets to identify columns to be included, if those details are not provided in the query problem definition. Use the screenshots provided to deskcheck your solution.



The screen shot above is a relationship window of the data.

Students register for a term and enroll in offered courses. Faculty are assigned to teach offered courses.

Write the SQL necessary to solve each of the 9 query problems defined in the problems below. No P/L statements are required as part of your solution. **Place ONLY your code (typed or snippet) in the Part 4 section of the Exam Answer Sheet.**

1. (1 point) Use the relational diagram in **Exhibit-1** to write the SQL to list all rows and all columns of the **ex20Course** table.

	COURSENO	CRSDESC	CRSUNITS
1	FIN300	FUNDAMENTALS OF FINANCE	4
2	FIN450	PRINCIPLES OF INVESTMENTS	4
3	FIN480	CORPORATE FINANCE	4
4	IS320	FUNDAMENTALS OF BUSINESS PROGRAMMING	4
5	IS460	SYSTEMS ANALYSIS	4
6	IS470	BUSINESS DATA COMMUNICATIONS	4
7	IS480	FUNDAMENTALS OF DATABASE MANAGEMENT	4

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2. (2 points) Use the relational diagram in **Exhibit-1** to write the SQL command to list all faculty members with a salary > \$70,000.00 Include the columns facID, facfirstname, faclastname, and facsalary. Your result set should look similar to the following:

	FACID	FACFIRSTNAME	FACLASTNAME	FACSalary
1	50987	VICTORIA	EMMANUEL	120000
2	94321	JULIA	MILLS	75000

3. (4 points) Use the relational diagram in **Exhibit-1** to write the SQL command to list the offerno, offerterm, offyear, courseno, crsdesc, crsunits, offnumenrolled from the ex20Offering and ex20Course tables. Additionally, calculate the tuition using the formula of crsUnits times offnumEnrolled times \$335 (per credit hours). Only display rows where the offnumenrolled is greater than 0. Order the data by offerno. Your result set should generate the following data:

	OFFERNO	OFFTERM	OFFYEAR	COURSENO	CRSDESC	CRSUNITS	OFFNUMENROLLED	TUITION
1	1234	FALL	2020	IS320	FUNDAMENTALS OF BUSINESS PROGRAMMING	4	5	6700
2	4321	FALL	2020	IS320	FUNDAMENTALS OF BUSINESS PROGRAMMING	4	5	6700
3	4444	SPRING	2020	IS320	FUNDAMENTALS OF BUSINESS PROGRAMMING	4	2	2680
4	5678	FALL	2020	IS480	FUNDAMENTALS OF DATABASE MANAGEMENT	4	1	1340
5	5679	SPRING	2020	IS480	FUNDAMENTALS OF DATABASE MANAGEMENT	4	9	12060
6	9876	SPRING	2020	IS460	SYSTEMS ANALYSIS	4	6	8040

4. (3 points) Use **Exhibit-1** and write the SQL to generate the list Faculty whose salary (facsalary) is greater than the average salary of all faculty. Include faculty name, facSalary and the avgSalary (of all faculty). Your result set should look similar to the following:

	FACID	FACNAME	FACSalary	AVGSALARY
1	50987	VICTORIA EMMANUEL	120000	67500
2	61098	LEONARD FIBON	70000	67500
3	94321	JULIA MILLS	75000	67500

5. (6 points) Use **Exhibit-1** to list any Faculty that was not scheduled to teach a course (No offering). Display the facid, facfirstname, faclastname columns from the ex20Faculty table. Demonstrate your understanding of SQL by solving the problem using 2 different methods demonstrated in the course:

1. IN with Nested Query
2. Outer Join

Both methods should produce a result set similar to the following:

	FACID	FACFIRSTNAME	FACLASTNAME
1	83210	CRISTOPHER	COLAN

6. (2 points) Use **Exhibit-1** as needed to produce the following query. The university has decided to increase faculty salaries for faculty members with the rank of "Professor" by 10%. Write the SQL statement to modify the data in the ex20Faculty table as needed. Then, identify the SQL statement would you use to save the changes made by the query. Finally, display the faculty data - to match the result set pictured below.

	FACID	FACRANK	FACSalary
1	50987	PROF	132000
2	72109	PROF	71500
3	61098	ASSC	70000
4	05432	ASST	35000
5	83210	ASST	40000
6	94321	ASSC	75000

7. (3 points) Use **Exhibit-1** as needed to produce the following query. List students who have registered for Spring 2020 and the count of how many courses they have registered for. Only display the students enrolled in 3 or more courses. (Note: the ex20Registration table data identifies that a student is registered for given term, but the ex20Enrollment table identifies the enrollments of a student.) Include the stdID, first and last name, stdMajor and the count of enrolled courses. Order the data by last name.

	STDID	STDFIRSTNAME	STDLASTNAME	STDMAJOR	CRSCOUNT
1	83456	LUKE	BRAZZI	IS	3
2	94567	WILLIAM	PILGRIM	IS	5

8. (3 points) Use **Exhibit-1** as needed to produce the following query. List **ALL** faculty members (facID, firstname and lastname) and count how many courses they have taught (ex20Offering) and count how many (different) terms they have taught in (also in ex20Offering). Order the result set by last name.

	FACID	FACFIRSTNAME	FACLASTNAME	CRSCOUNT	TERM COUNT
1	83210	CRISTOPHER	COLAN	0	0
2	50987	VICTORIA	EMMANUEL	1	1
3	61098	LEONARD	FIBON	4	2
4	72109	NICKI	MACON	2	1
5	94321	JULIA	MILLS	2	1
6	05432	LEONARD	VINCE	4	3

9. (6 points) Use **Exhibit-1** as needed to produce a View named **"xViewP9"** for the following query definition. List courses that have been offered with a count of how many students (across all terms) were enrolled and count how many faculty were assigned to teach the course offering. **Include the code to create the view** – and the code needed to execute your view to display the result set. Your result set should look similar to the following:

	COURSENO	CRSDESC	STDCOUNT	FACCOUNT
1	FIN300	FUNDAMENTALS OF FINANCE	2	1
2	FIN450	PRINCIPLES OF INVESTMENTS	2	1
3	FIN480	CORPORATE FINANCE	1	1
4	IS320	FUNDAMENTALS OF BUSINESS PROGRAMMING	12	6
5	IS460	SYSTEMS ANALYSIS	6	2
6	IS480	FUNDAMENTALS OF DATABASE MANAGEMENT	10	2

Hint: Solve this one in pieces. You may, if you find it more manageable, create multiple views to break the problem down into separate result sets and then join the views to display the data as pictured above. Use the Relationship Diagram provided to understand how to extract the counts by courses. Remember, Students first register, and then enroll in a course (that is offered). Faculty are assigned to an offered course.