The University of Queensland
School of Information Technology and Electrical Engineering
INFS1200/7900 Midterm Examination

Name: _____   Student #: _____

Notes about this examination	

1. You have **10 minutes** reading time and **100 minutes** to write this examination.
2. Write your name and student #.
3. You may use a pencil to write your solutions.
4. Answer all the questions on this paper.
5. The marks for each question are given in [].
6. Good luck!

Question	Mark	Max
Q1		7
Q2		10
Q3		12
Q4		8
Q5		10
Q6		8
Q7		10
Total		65

Q1. **[7 marks]** Consider the ER diagram below, and determine whether each of the following claims is true or false; briefly justify your answer for both options.
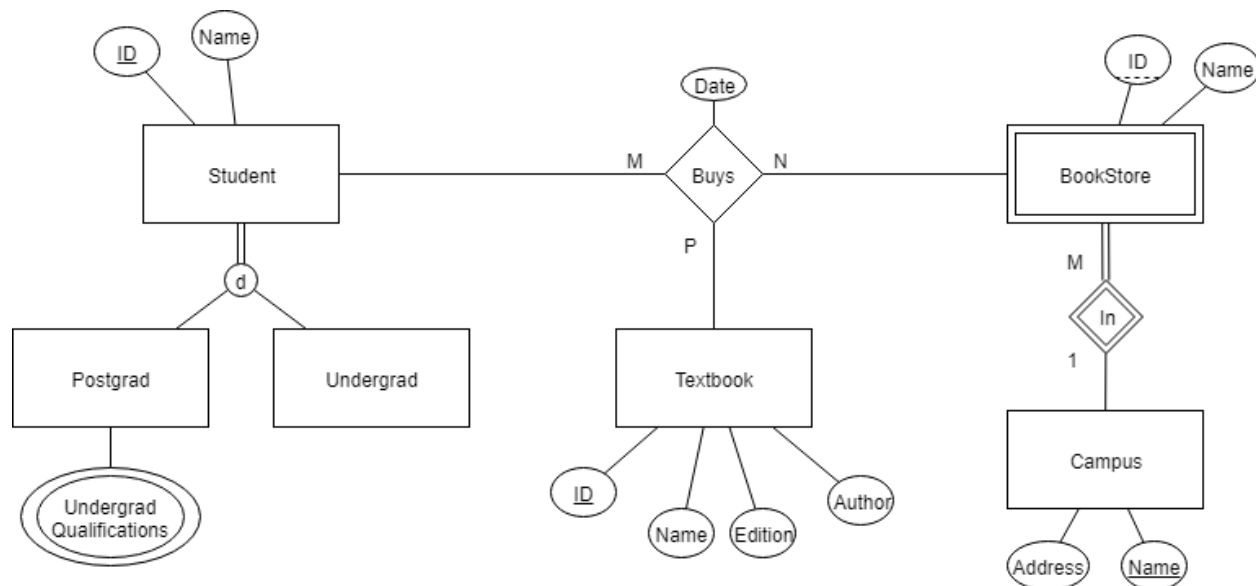
Claims	T/F?	Brief Justification
1. The Buys table can be converted to 3 regular binary relationships (e.g."Student-Needs-Textbook", "Student-goes-to-BookStore" and "BookStore-Sells-Textbook").		
2. The relation "Buys" will have 3 foreign keys		
3. A textbook may have many different authors		
4. A high school student may purchase books		
5. No bookstores can have the same name		
6. Given a textbook ID we can find all the students who have purchased it.		
7. Undergraduates are allowed to purchase many books from a single BookStore		

Q2. **[10 marks]** Construct an ER diagram for the following Universe of Discourse

Dotify is an online music streaming service used by millions of people worldwide.

Users are identified by their email address and their name, password and date of birth are recorded. Users may hold premium or free accounts. Each song in the database is given a unique ID, name, duration and artist. The platform also stores songs that are similar to each other. Artists have a unique artistID, name and one or more musical styles (rock, pop, classical etc).

Users may use the platform to listen to songs and the number of time a song is played by a user is recorded. Users may also make playlists. Playlists in the platform may share the same name, but a single user cannot have two playlists with the same name. Playlists are made up of at least one song. Users can follow other user's playlists.

Q3. **[12 marks]** Answer the following questions.

Transform the ER diagram into a relational schema using the methods discussed in class.

Remember to include your foreign keys in the form:
table1.attribute 1 references table2.attribute1
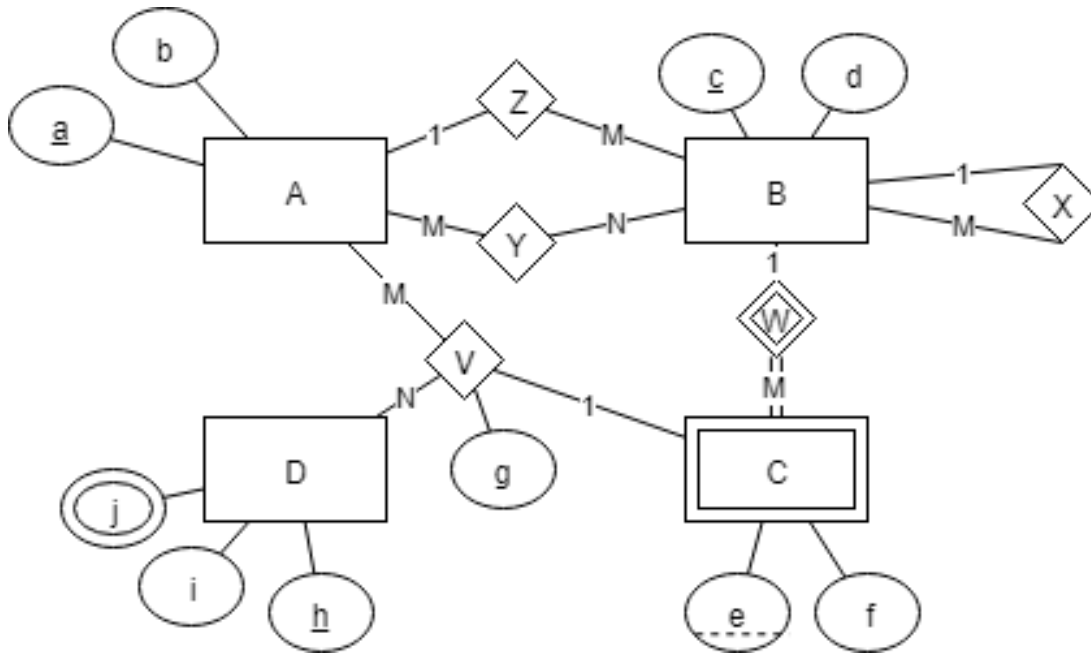
Q4. **[8 marks]** Reverse engineer this relational schema to an ER diagram

A[<u>a</u>, b, c]
B[<u>d</u>, e, a]
C[<u>d</u>, f]
D[<u>d</u>, g]
E[<u>a, h</u>, i]
F[<u>d, a, h</u>, j]

B.a references A.a
C.d references B.d
D.d references B.d
E.a references A.a
F.d references C.d
F.(a, h) references E.(a, h)

Q5. [**10 marks**] Given the following schema and data answer the following questions:

MOVIE[movieID, title, synopsis, release]
CASTMEMBER[castID, Name, DOB]
ROLE[movieID, castID, role]

ROLE.movieID references MOVIE.movieID
ROLE.castID references CASTMEMBER.castID

MOVIE

MovieID	Title	Synopsis	Release
152	Guardians of the Galaxy	I am Groot	2014-07-31
178	Guardians of the Galaxy 2	I am Groot 2	2017-04-19
183	Guardians of the Galaxy 3	Need more Groot	2020-01-01

CASTMEMBER

CastID	Name	DOB
2193	Chris Pratt	1979-06-21
2515	Zoe Saldana	1978-06-19
6234	Dave Bautista	1969-01-18
2346	Vin Disel	1967-07-18

ROLE

MovieID	CastID	Role
152	2193	Peter Quill
178	2346	Baby Groot
152	2515	Gamora
178	2515	Gamora

Q5A. Insert the tuple <152, 6234, Drax the Destroyer> into table ROLE.

Does this operation violate an integrity constraint? Write either "yes" or "no":_____

If yes, state the type of constraint violated: _____

and briefly describe how the constraint was violated: _____

_____

Q5B. Delete the tuple with castID 2346 from the CASTMEMBER table.

Does this operation violate an integrity constraint? Write either "yes" or "no":_____

If yes, state the type of constraint violated: _____

and briefly describe how the constraint was violated: _____

_____

Q5C. Update the tuple <152, 2193, Peter Quill> to <172, 2193, Peter Quill> in the ROLE table.

Does this operation violate an integrity constraint? Write either "yes" or "no":_____

If yes, state the type of constraint violated: _____

and briefly describe how the constraint was violated: _____

_____

Q5D. Insert the tuple <2834, Bradley Cooper, NULL> into the CASTMEMBER table.

Does this operation violate an integrity constraint? Write either "yes" or "no":_____

If yes, state the type of constraint violated: _____

and briefly describe how the constraint was violated: _____

_____

Q5E. Insert the tuple <178, 2346, Baby Groot> into the ROLE table.

Does this operation violate an integrity constraint? Write either "yes" or "no":_____

If yes, state the type of constraint violated: _____

and briefly describe how the constraint was violated: _____

_____

Q6. **[8 Marks]** Answer the following questions related to functional dependencies and annomolies.

Q6A. **[2 Marks]** In the instance of the relation R(A,B,C,D,E) shown below, which of the following functional dependencies (FD's) **can** be true and hold?

A	B	C	D	E		
1	2	3	4	5	I.	1 Only
1	4	3	4	5	II.	2 Only
1	2	4	4	1	III.	1 and 3
2	3	6	5	1	IV.	2 and 3

1: AB→ C   2: B→ D   3: DE→A

Q6B. **[6 Marks]** Answer the following questions given the relation below where there is a functional dependency B→C.

A	B	C
1	1	4
6	1	4
3	4	4
2	2	3
1	3	2

Claims	T/F?	Brief Justification
1. If we change B on the first row from 1 to 2 we no longer have a legal instance.		
2. If we change A on the 4th row from 2 to 3 we no longer have a legal instance.		
3. If we change C on the first row from 4 to 2, we must also change C on the second row from to 2 as well.		
4. Deleting the last row would result in a deletion anomaly		
5. Deleting the first row would result in a deletion anomaly		
6. Modifying C on the 3rd line would result in a modification anomaly		

Q7. **[10 Marks]** Answer the following questions on closures and candidate keys.

Q7A. **[3 Marks]** Compute $\{AB\}^+$ given the following functional dependencies

A→ C, D B→ D, E AB → F	$\{AB\}^+ =$
A→ D B→ E C → E, F, G, H AB → E, F	$\{AB\}^+ =$

Q7B. **[7 Marks]** Find all the candidate keys of the following relations

R[A, B, C, D, E, F] A → B, C C → D D → E, A B, C → F	Candidate keys
R[A, B, C, D, E, F] A → F B → C, D C, D → E E → C, B	Candidate keys

This space is intentionally left blank. You can use it to answer questions or as scratch paper
(if you use this, CLEARLY indicate the connection between this work and the problem it is for both here and where the problem is stated!)