THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

School of Information Technology and Electrical Engineering

INFS1200/7900 MOCK QUIZ 2 Examination

Name: _____

Student Number: _____

_____
Signature

Notes about this examination

1. You have **10 minutes** reading time and **90 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 []. 50 marks in this quiz equals 15 marks in the total assessment of this course.
6. Good luck!

Question 1. [5 marks] Given the following Relations and FDs, find the key(s). *Hint: Make sure you validate your key by computing the closure.*

i) R(ABCD), F = {AB → C, A → D}

AB

ii) R(ABCDE), F = {A → BCD, BC → ADE}

A, BC

iii) R(XYZ), F = {X → Y, Y → Z}

X

iv) R(ST), F = {ST → ST}

ST

Question 2. [10 Marks]
a) For each of the following questions, perform the following

1.   Determine the candidate key(s) for the given relation
2.   Determine the highest normal form of the given relation
3.   Decompose the given relation to achieve BCNF

i) **[4 Marks]** Production(studio, studioName, location, movieName, yearOfRelease, star, role, contract, commenced, completed)

F= { studio→ studioName, location,
        movieName→ yearOfRelease,
        movieName, star→ role,
        role → Contract,
        studio, movieName→ commenced, completed }

Key: studio, movieName, star

Normal Form: 1NF

BCNF relations:

Studio (<u>studio</u>, studioName, location) *[remaining: Production(studio, ~~studioName, location,~~ movieName, yearOfRelease, star, role, contract, commenced, completed)]*

Movie (<u>movieName</u>, yearOfRelease) *[remaining: Production(studio, ~~studioName, location,~~ movieName, ~~yearOfRelease,~~ star, role, contract, commenced, completed)]*

Star (<u>movieName, star</u>, role) *[remaining: Production(studio, ~~studioName, location,~~ movieName, ~~yearOfRelease,~~ star, ~~role,~~ contract, commenced, completed)]*

RoleContract (<u>role</u>, contract) *[remaining: Production(studio, ~~studioName, location,~~ movieName, ~~yearOfRelease,~~ star, ~~role, contract,~~ commenced, completed)]*

MobvieStudio (<u>studio, movieName</u>, commenced, completed)
[Production(studio, ~~studioName, location,~~ movieName, ~~yearOfRelease,~~ star, ~~role, contract, commenced, completed)]

Production (<u>studio, movieName, star</u>)

ii) **[4 Marks]** R(ABCD), F = {AB → CD, C → D}

Key: AB
Normal Form: 2NF

BCNF relations: R1 (A, B, C)
R2 (C, D)

b) **[2 Marks]** Give an example of a relation that can never have a 2NF violation no matter what FDs there might be on the relation.

A relation which has a key with a single attribute, e.g. R (A, B, C). Since the key is a single attribute, there can never be a partial dependency and hence a 2NF violation.

Question 3. [10 Marks] Determine if any of the below relations are in 3NF. If not, decompose this relation into 3NF using the algorithm we covered in class and in the textbook. Show all your working.

(a) **[5 Marks]** R(A, B, C, D)   F1 = {AB→ C, AB→ D, C→ A, D→ B}.

(b) **[5 Marks]** T(A, B, C, D)   F2 = {AB→ C, AB→ D, C→ D}.

(a)
Find all keys: to test all possible subsets {A, B, C, D, AB, AC, AD, BC, BD, CD, ABC, ABD, ACD, BCD, ABCD}.
  1) A^+ = A, B^+ = B, C^+ = CA, D^+ = DB. So none of {A, B, C, D} is a key.
  2) AB^+ = ABCD, AC^+ = AC, AD^+ = ADBC, BC^+ = BCAD, BD^+ = BD, CD^+ = CDAB, so we have found 4 keys: AB, AD, BC, CD.
  3) Thus, no more checks needed.

As all attributes are primary attributes, this is already in 3NF.

(b)
Find all keys: as B doesn't appear on the RHS of any FDs, all keys much contain at least B. So we need to test all possible subsets with B: {B, AB, BC, BD, ABC, ABD, ABCD}.
  4) B^+ = B, so is not a key.
  5) AB^+ = ABCD, BC^+ = BCD, BD^+ = BD, so we have found 1 key: AB.
  6) Thus, no more checks needed.

D is not a primary attribute, C→ D violates 3NF as C is not a superkey.

Minimal Cover: Remove the FD AB->D since it can be derived by AB->C and C->D(Transitivity). F2={AB -> C, C -> D} are in minimal cover.
 So we can create the following tables: R1(ABC), R2(CD). As R1 contains a key, no need to create more tables.

Question 4. [7 Marks] The schema and some example instances are given below:

User (<u>username</u>, fullName, accountStatus)
Song (<u>songID</u>, songName, artist)
Playlist (<u>username, playlistName</u>)
PlaylistSong (<u>username, playlistName, songNum</u>, songID)

Playlist.username references User.username
PlaylistSong.songID references Song.songID
PlaylistSong.(username, playlistName) references Playlist.(username, playlistName)

User

username	fullName	accountStatus
xXxMusicLoverxXx	Katy Perry	Premium
TinySinger123	Ariana Grande	Premium
ImTheVoice	John Farnham	Free

Song

songID	songName	artist
14234	Friday	Rebecca Black
178237	Mans not hot	Big Shaq
12986	All Star	Smash Mouth

Playlist

playlistName	username
BESTSONGS	TinySinger123
SchoolSongs	TinySinger123
…but it's All Star	ImTheVoice

PlaylistSong

playlistName	username	songNum	songID
BESTSONGS	TinySinger123	1	14234
SchoolSongs	TinySinger123	1	178237
All star but its…	ImTheVoice	1	12986
All star but its…	ImTheVoice	2	12986
All star but its…	ImTheVoice	3	12986

a) Assuming ON DELETE CASCADE was specified on all foreign keys in this database, strike out all the tuples that will be deleted as a result of:

DELETE FROM User WHERE username='TinySinger123';

User: 2; Playlist: 1,2; PlaylistSong: 1, 2

b) Assuming ON UPDATE CASCADE was specified on all foreign keys in this database, which tuples will be updated as a result of:

UPDATE SONG SET songID = 14233 WHERE songID=14234;

Song: 1; PlaylistSong: 1

Question 5. [18 marks]

Person (secretID, monthOfBirth, eyeColor, headCircumference, favPizzaTopping, favMagicalCharacter)

      Key: secretID
monthOfBirth is 01-12
headCircumference is in cm
favMagicalCharacter examples are Gullom, Dobby, Tinker Bell etc.

Movie (secretID, movieName, genre, watchedInYear, theatreOrDVD, whyILikeIt)

      Key: secretID, movieName
Legal values for genre: action, comedy, drama, sci-fi, animation, horror
watchedInYear is entered as yyyy
Legal values for theatreOrDVD (indicated whether you watched it in theatre or on DVD): theatre, DVD
whyILikeIt is free text

App (secretID, app, since, hoursPerWeek, rating)

      Key: secretID, app
Example values for app: facebook, twitter, shazam, etc
rating is 1-5 with 1 being most favorite, and 5 being least
since is a date field to be entered as yyyy-mm-dd

a) **[1 Mark]** List all movies for which reason for liking has the phrase "special effects". The query output should not include any duplicates. (Hint: reason for liking can be found in the attribute "whyILikeIt).

SELECT DISTINCT movieName
FROM Movie
WHERE whyILikeIt LIKE '%special effects%';

b) **[2 Marks]** Display the average hours per week, and average rating for each app.

SELECT app, AVG (hoursPerWeek), AVG(rating)
FROM apps
GROUP BY app;

c) **[5 Marks]** What is/are the least favorite pizza topping/s. Display pizza topping. (Hint: Least favorite means fewest number of people like them).

SELECT favPizzaTopping

FROM person

GROUP BY favPizzaTopping

HAVING count (*) <= ALL

        (SELECT count (*)
         FROM person
         GROUP by favPizzaTopping);

d) **[5 Marks]** Display secretID of all persons who use at least all the apps that person with secretID "Bobby" uses.

SELECT DISTINCT secretID FROM apps X
WHERE NOT EXISTS

(SELECT *
FROM apps Y
WHERE secretID = "Bobby" AND NOT EXISTS

(SELECT *
FROM apps
WHERE secretID = X.secretID AND app = Y.app)) ;

e) **[5 Marks]** Which action movie has been watched in theatre by at least 25 persons (Hint: genre = 'action')?

SELECT movieName
FROM movie
WHERE genre = "action" AND theatreOrDVD = "theatre" GROUP BY movieName
HAVING count (*) >= 25;

END OF EXAMINATION