THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

The University of Queensland

School of Information Technology and Electrical Engineering

INFS1200/7900 MOCK QUIZ 1 Examination

Name: _____

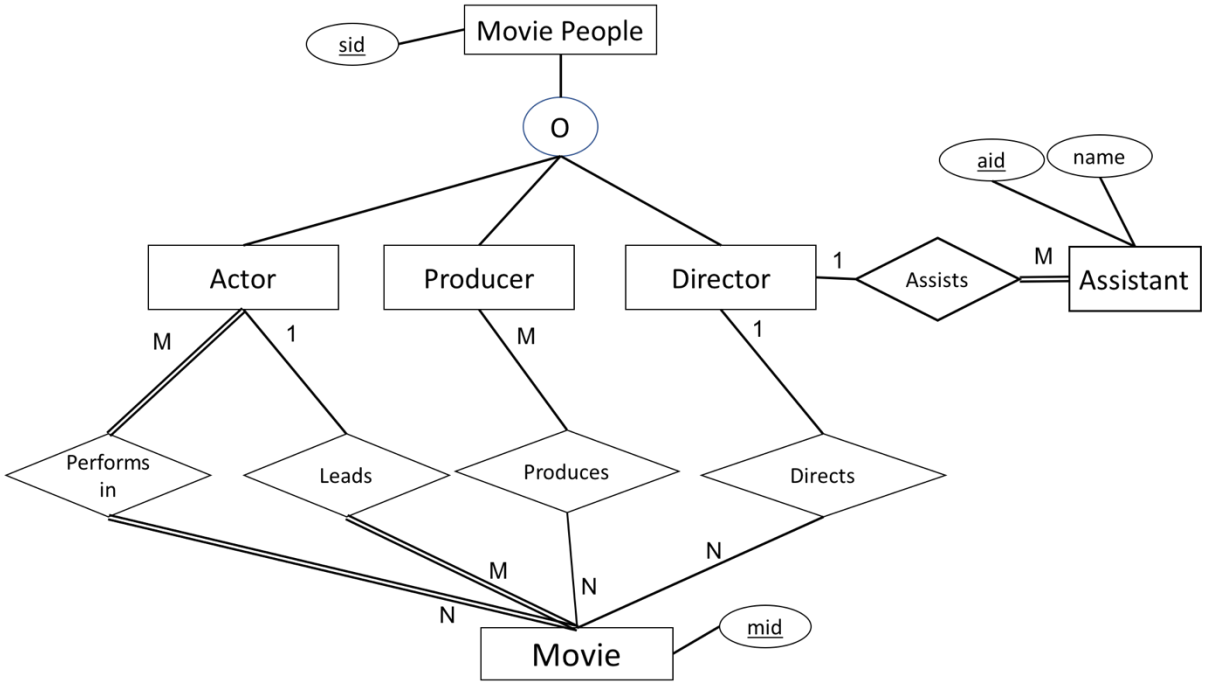
Student #: _____

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 [].
6. Good luck!

Question	Mark	Max
Q1		10
Q2		10
Q3		12
Q4		8
Q5		10
Q6		15
Total		**65**

Q1. **[10 marks]** Assume that Movies is a populated database, which is designed using the ER diagram below. Respond to the following statements with True, False or Maybe. Assign a response of maybe to statements that, while not explicitly shown to be True, cannot be proven False based on the given model. For each response, briefly justify your answer.



Claims	**True/False/Maybe**
1. There are no actors in this database that have not been in a movie.	True All actors must participate in the “performs in” relationship.
2. There are some actors who have acted in more than ten movies.	Maybe Actors may participate in many movies. We do not know if this has occurred.
3. Some actors have done a lead role in multiple movies.	Maybe Actors may be the lead in many movies. We do not know if this has occurred.
4. A movie can have multiple lead roles.	False A movie may have only one lead role.
5. Every director has been an actor in some movie	Maybe Directors may also be actors. We do not know if this has occurred.
6. No movie has a director who also acted in that movie	Maybe Directors may also be actors in the same movie. We do not know if this has occurred.
7. Two directors can share the same assistant	False Each assistant ‘assists’ only one director.
8. Some movie people have been involved with 0 movies.	Maybe Only actors must participate in movies – producers, directors and movie people have no restrictions. We do not know if this has occurred.
9. No two assistants share the same name.	Maybe Name is not part of the primary key so assistants may share the same name. We do not know if this has occurred.
10. A movie can have multiple Producers and multiple Directors.	False A movie may not have more than one director.

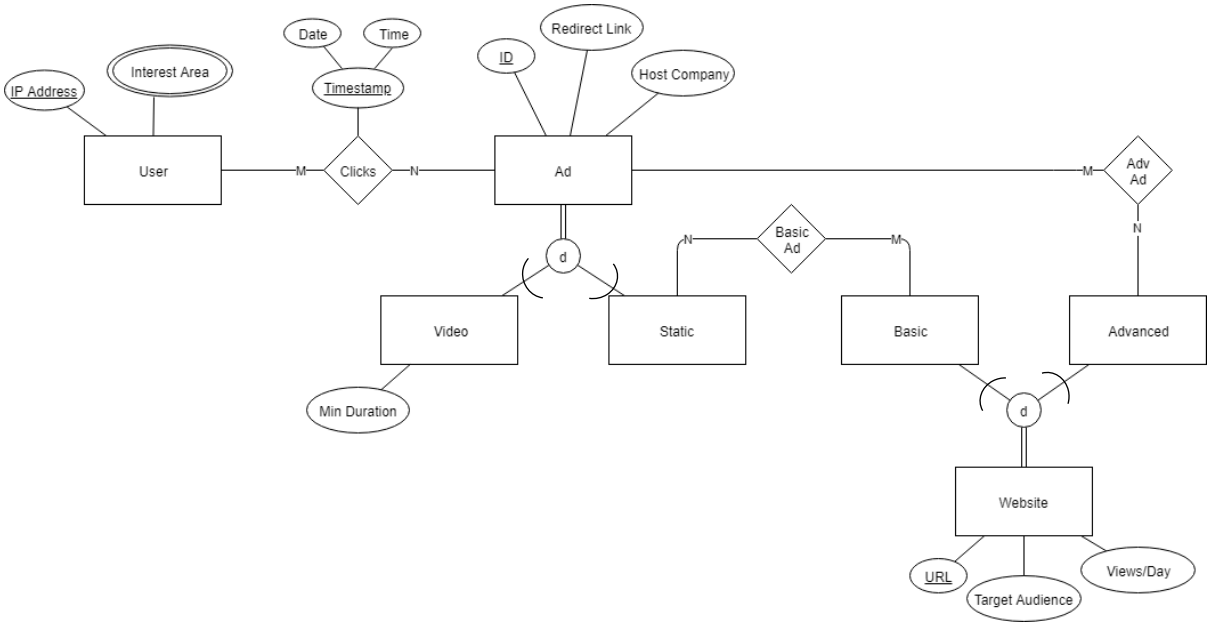
Q2. **[10 marks]** Construct an ER diagram for the following Universe of Discourse

ElgoogAds is a company providing websites with advertising content to assist with monetization.

Each Ad has a unique ID, as well as a redirection link and the advertising company's name. Ads can be static or video advertisments. Video ads also store the minimum duration before they can be skipped.

ElgoogAds also tracks the details of the websites hosting their ads. Each of these websites has a unique URL, target audience and average views per day. These websites can sign up to a basic or advanced plan. Advanced websites have their payment details recorded. The basic plan entitles the page to use static ads, which generate less revenue, while the advanced plan allows the website to use both video and static ads.

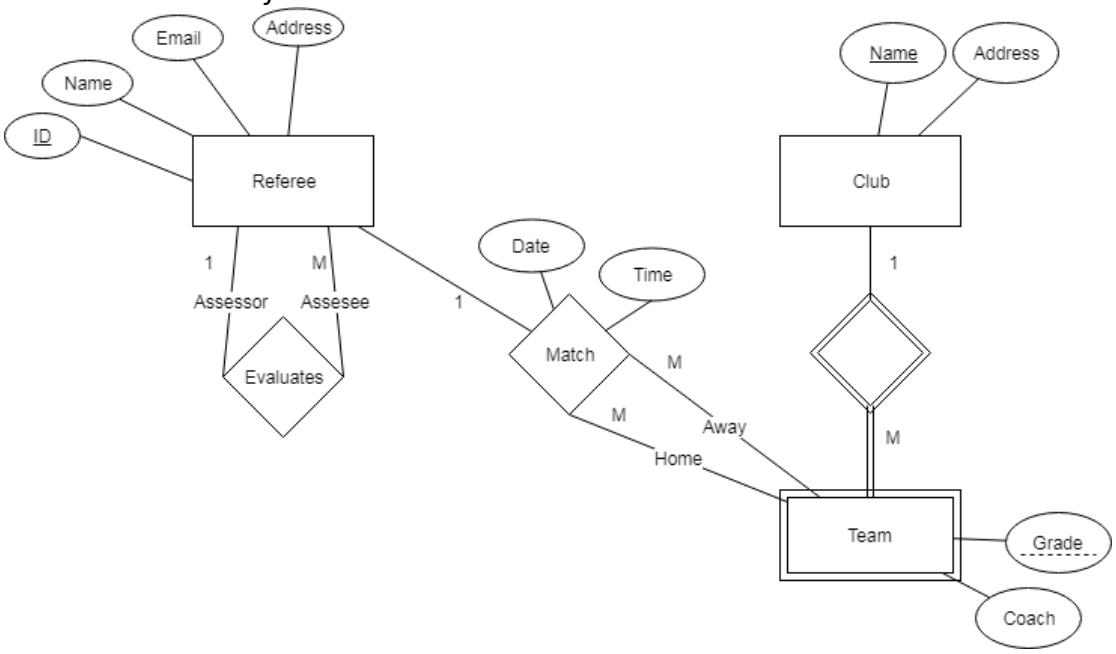
Internet users who interact with ads are tracked via their unique IP address. The interest areas of each user are also stored based on their browsing patterns. ElgoogAds logs each time a user clicks on an ad and stores the date and time that it occurred. Each user can click on the same ad multiple times.



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



REFEREE[ID, Name, Email, Address, AssessorID]

CLUB[Name, Address]

TEAM[ClubName, Grade, Coach]

MATCH[HomeClubName, HomeGrade, AwayClubName, AwayGrade, RefereeID, Date, Time]

REFEREE.AssessorID references REFEREE.ID

TEAM.ClubName references CLUB.Name

MATCH.(HomeClubName, HomeGrade) References TEAM.(ClubName, Grade)

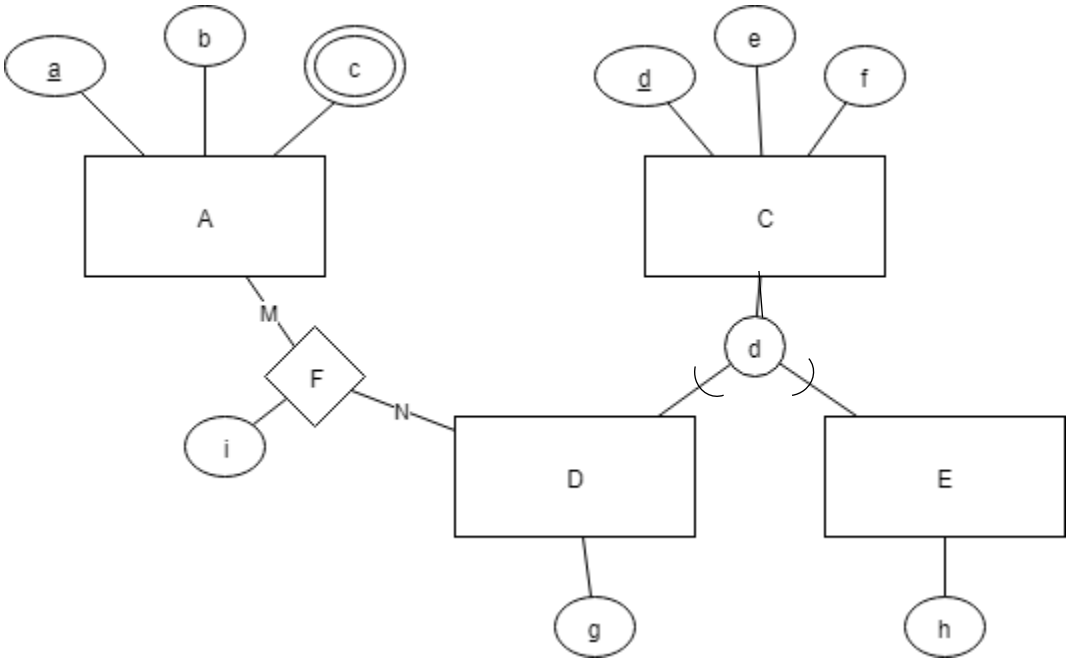
MATCH.(AwayClubName, AwayGrade) references TEAM.(ClubName, Grade)

MATCH.RefereeID references REFEREE.ID

Q4. **[8 Marks]** Reverse engineer this relational schema to an ER diagram

A[a, b]
B[a, c]
C[d, e, f]
D[d, g]
E[d, h]
F[a, d, i]

B.a references A.a
D.d references C.d
E.d references C.d
F.a references A.a
F.d references D.d



Q5. **[10 marks]** Question 3. Relational Model and Database Systems (3 Marks)

The schema and instances for a relational database are given below.
An online Puzzle-Solving system has been developed that contains a database of challenging puzzles. Both students and teachers can register in this system and obtain a login and working space. Once a solver opens a puzzle, it appears in their space in a so-called "unsolved" list. Solvers can have unlimited attempts to solve the puzzle and submit their solution. When and if the right solution is submitted, the Puzzle is transferred to the "solved" list for that solver. Dates of both first opening the puzzle and of solving the puzzle are recorded in this system.

There are three levels of Puzzle "Difficulty", namely Simple, Advanced and Hard. The "Solutions" attribute in the PUZZLE relation can not be retrieved by any solver, and are only used by the system to check solutions submitted by solvers. "Type" attribute in the SOLVER relation has two values, "Student" and "Teacher". "PName" is a unique Puzzle Name. DateOpen is auto-populated when the solver first opens the puzzle. A NULL value for the "DateSolved" attribute indicates that the given puzzle has not yet been solved by the given solver.

PUZZLE [PName, Difficulty, Solution]
SOLVERS [RegNo, Password, Name, RegistrationDate, Type]
SOLVED [RegNo, PName, DateOpen, DateSolved]

SOLVED.RegNo references SOLVERS.RegNo
SOLVED.PName references PUZZLE.PName

The sample instances below are indicative of the domain (data type) for the various attributes.

PUZZLE

PName	Difficulty	Solution
Bits	Simple	101
Astro	Advanced	Teapot
Travel	Hard	9 days

SOLVERS

RegNo	Password	Name	RegistrationDate	Type
112	XXVT	Steve	1/9/2007	STUDENT
227	9987	Lisa	1/9/2008	TEACHER

SOLVED

RegNo	PName	DateOpen	DateSolved
112	Bits	1/10/2007	5/10/2007
227	Bits	1/4/2009	3/4/2009
112	Astro	1/2/2008	16/5/2008

Work out the questions below on the population given above.

a) Give an example of a tuple delete that would result in referential integrity constraint violation

Delete <Bits, Simple, 101> from PUZZLE

b) Give an example of

a super key: PUZZLE.(PName, Difficulty)

a minimal key: PUZZLE.PName

a foreign key: SOLVED.PName

c) Update the tuple <112, XXVT, Steve, 1/9/2007, STUDENT> to <null, XXVT, Steve, 1/9/2007, STUDENT > in relation "SOLVERS".
Does this operation violate an integrity constraint? Write either "yes" or "no":
YES
If yes, state the type of constraint violated:
ENTITY
and briefly describe how the constraint was violated:
No part of the Primary Key can be NULL.

d) Insert the tuple <227, Travel, Null, Null> in relation "SOLVED".
Does this operation violate an integrity constraint? Write either "yes" or "no":
Yes
If yes, state the type of constraint violated:
Domain
and briefly describe how the constraint was violated:
The specification says the "date opened" attribute is automatically populated -> therefore it cannot be NULL (Domain violation)

e) Give an example of a tuple insert in relation SOLVERS that would result in a domain constraint violation

<NotAValidID, Password, John, 5/2/2018, STUDENT>

The ID should be a number

f) Which attributes in the given schema have domains with 3 or less values?

SOLVERS.Type and PUZZLE.Difficulty

Q6. **[10 marks]** answer the following questions on functional dependencies

A	B	C	D
1	2	3	4
1	2	4	3
2	1	3	4
3	1	2	2
1	3	3	4

A) Which of the following functional dependencies may hold given the data in R(ABCD). Circle all that apply.

1. A → B
2. C → D
3. D → C
4. B → C
5. BC → D
6. D -> AB

B) Use the relation R(<u>AB</u>CD) below to answer the following questions. There are two functional dependencies in this relation

1. A → C

2. C → D

<u>A</u>	**<u>B</u>**	**C**	**D**
1	3	2	5
1	4	2	5
2	3	1	2
3	2	1	2

i) Give an example of an insertion anomaly

Cannot insert B=C -> D=5 without data for A (because A is the Primary Key).

ii) Give an example of a deletion anomaly

DELETE <3, 2, 1, 2> we lose information A->C (3->1)

iii) Give an example of a modification anomaly

UPDATE <1, 3, 2, 5> to <1, 3, 3, 5> creates inconsistency with 1->2 and 1->3 (A->C)

C) Find the closure of A, and all the candidate keys of the following relations

i) **R[A, B, C, D, E]**

A → B, C

B → D

D → E, A

$\{A\}^+ = \{A, B, C, D, E\}$

Candidate Keys: A, B, D

ii) **R[A, B, C, D, E, F]**

A → B

C → D

B, C → E

E → F

D → C

$\{A\}^+ = \{A, B\}$

Candidate Keys: AC, AD