

MILITARY COLLEGE OF SIGNALS
MIDTERM EXAM
BESE 15-A
CPS 480 Database Systems

Instructor: A/P Dr. Imran Siddiqi

Time: 90 Minutes
Max Marks: 30

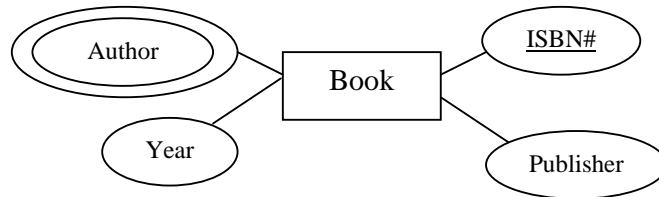
Note: This question paper comprises 3 pages.

(3+5)

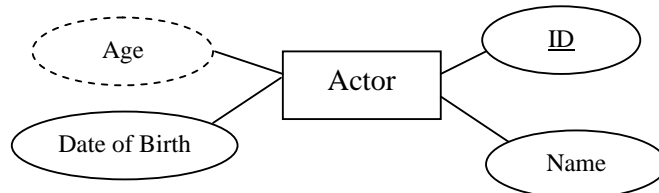
1. a. Briefly discuss the difference between:
- Database schema and instances
 - Physical and logical data independence
 - Primary key and foreign key

b. Convert the following *entity relationship diagrams* to relations. You need to show the relational schema for each relation.

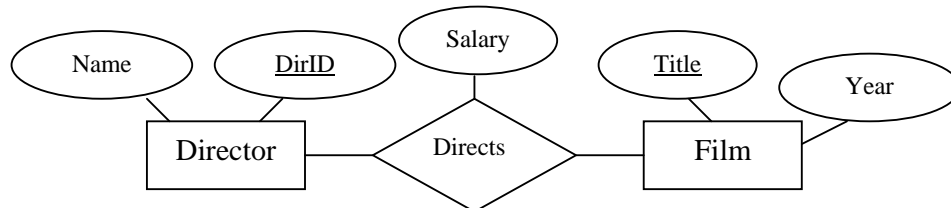
i.



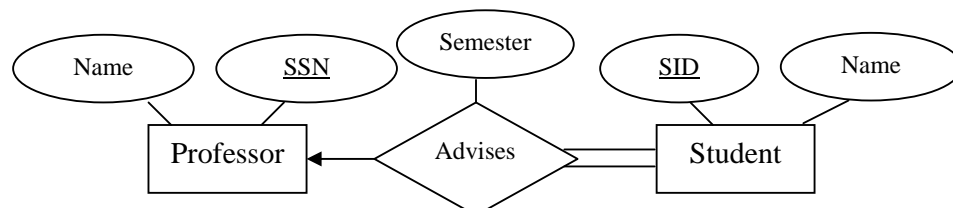
ii.



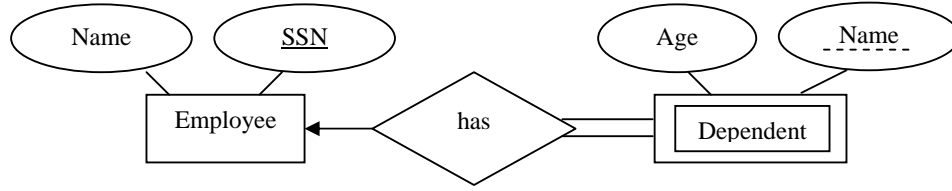
iii.



iv.



v.



(2+7)

2. A simple movie database comprises five relations with the following relational schemas:

Movie (movieTitle, yearOfRelease, duration)

Star (starName, age, rating)

Studio (studioName, location)

Produces(studioName, movieTitle)

AppearsIn (starName, movieTitle)

- a. Convert the given relational database to a simple Entity Relationship Diagram (Cardinalities and participation constraints are NOT required).
- b. Formulate the following queries in relational algebra:
 - i. When was the movie 'Cast Away' released.
 - ii. Which stars of less than 20 years of age appeared in the movie 'Sword Fish'.
 - iii. Which stars do not appear in the movie 'Inception'.
 - iv. Find the names of stars who appear in movies produced by a studio located in 'California'.
 - v. Find the titles and durations of the movies produced by 'Fox Studios'.
 - vi. Find the names of stars who have appeared in all the movies released in the year 2010.
 - vii. Find the age of the oldest star.

(4+3)

3. a. Given two relations R and S , where R contains M tuples, S contains N tuples, and $M > N > 0$, give the minimum and maximum possible sizes (in tuples) for the resulting relation produced by each of the following relational algebra expressions:

i. $R - S$

ii. $R \cup S$

iii. $R \cap S$

iv. $R \bowtie S$

- b. Consider the following schema:

Suppliers(sid, sname, address)

Parts(pid, pname, color)

Catalog(sid, pid, cost)

Given the following relational algebra queries, state what they compute:

i. $\pi_{sname}(\pi_{sid}(\sigma_{color='red'}(Parts)) \bowtie \sigma_{cost < 100}(Catalog)) \bowtie Supplier$

ii. $\pi_{sid, pid}(Catalog) \div \pi_{pid}(\sigma_{color='red'}(Parts))$

iii. $\pi_{sid}(Supplier) - \pi_{sid}(\pi_{pid}(\sigma_{color='red'}(Parts)) \bowtie (Catalog))$

(4+2)

4. Consider the following instances in a relational database:

Patient

<u>patientID</u>	patientName	dateAdmitted	dateCheckedout
P101	Nicole	15-10-2010	18-10-2010
P102	Georges	25-10-2010	-
P103	Stockman	30-10-2010	-

Doctor

<u>doctorID</u>	doctorName	Specialization
D501	Claudie	Cardiology
D502	Nicolas	ENT

Patient-Doctor

<u>doctorID</u>	<u>patientID</u>	lastExaminationDate
D501	P101	17-10-2010
D502	P101	18-10-2010
D501	P102	26-10-2010
D502	P103	30-10-2010

- a. List the constraints that are violated (if any) if you try to:
- Insert the tuple ('D501', 'P101', '18-10-2010') in the relation **Patient-Doctor**.
 - Insert the tuple ('D501', 'P104', '25-10-2010') in the relation **Patient-Doctor**.
 - Insert the tuple ('D503', 'Claudie', 'Cardiology') in the relation **Doctor**.
 - Delete the data for 'P101' from the relation **Patient**.
- b. Can we place the attribute 'lastExaminationDate' with **Patient** or **Doctor**? If Yes/No, Why?

+++++++ Bon Courage ++++++