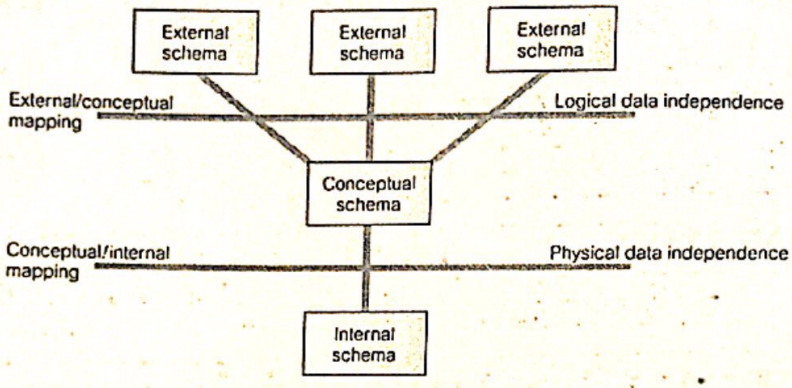
SECTION A [40 MARKS]

1. Briefly describe four characteristics of the database approach that make it superior to the File-Based system of managing data and information **(4 Marks)**
2. Using the three level ANSI-SPARC architecture, briefly discuss how;



a) The external/conceptual mapping enables logical data independence **(2 Marks)**

b) The conceptual/internal mapping enables physical data independence **(2 Marks)**

3. Describe the rules for mapping the following concepts in a conceptual database design into a logical database design:
   a) One-to-One (1..1) binary relationship with Optional-Optional participation **(2 Marks)**
   b) One-to-Many (1..M) recursive relationship **(2 Marks)**
4. Consider table T= (A, B, C, D, E, F, G) with the following functional dependencies: {D, E, G →A, F, B, C; E→A,B; B→C}
   i) Identify the types of functional dependencies with illustrations **(2 Marks)**
   ii) List the relations (tables) in the 3NF clearly identifying the primary and foreign keys **(8 Marks)**
5. Write an SQL statement to Create a table Employees with the following attributes: **(6 Marks)**

ColumnName	KindofData	Maximum Size	Constraints
empId	Text	20	Primary key
fName	Text	15	
lName	Text	15	Not null
dob	date		

6. What is the purpose of the following clauses in a select statement? **(12 Marks)**
   i). FROM
   ii). WHERE
   iii). GROUP BY
   iv). HAVING
   v). SELECT
   vi). ORDER BY

SECTION B [60 MARKS]

Question 1

The tables below are part of the HLFM Public Library. Study them to answer the questions that follow

User

user-Id	full_name	enabled	last_login
1	John Bbale	Yes	2017-10-25 10:26:10.015152
2	Alice Murungi	Yes	2017-10-25 10:26:50.295461
3	Harry Musinguzi	Yes	2017-10-25 10:26:50.295461
4	Jane Atim	No	2017-10-25 10:36:43.324015

UserAddress

user-id	physicalAddress	city
1	22 Market Street	Kampala
2	1 Kyaggwe Road	Kampala
3	30 Kitugum Road	Gulu

Book

id	title	author	published_date	isbn
1	My First SQL book	Mary Parker	2012-02-22 12:08:17.320053	981483029127
2	My Second SQL book	John Mayer	1972-07-03 09:22:45.050088	857300923713
3	My Third SQL book	Cary Flint	2015-10-18 14:05:44.547516	523120967812

CheckOuts

user_id	book_id	checkOut_date	return_date
1	1	2017-10-15 14:43:18.095143	
1	2	2017-10-05 16:22:44.593188	2017-10-13 13:05:12.673382
2	2	2017-10-15 11:11:24.994973	2017-10-22 17:47:10.407569
5	3	2017-10-15 09:27:07.215217	

BookReviews

book_id	reviewer_name	content	rating	Published_date
1	John Bbale	My First Review	4	2017-10-13 13:05:12.673382
2	John Bbale	My Second Review	5	2017-10-22 17:47:10.407569
2	Alice Murungi	Another Review	1	2017-10-13 13:05:12.673382

a) Write an SQL statement that will return

i) The number of users who have not returned books yet **(3 Marks)**

ii) The details of users whose accounts are not enabled **(3 Marks)**

iii) Reviewers who have done reviews other than a 'first review' **(3 Marks)**

iv) The isbn and title of books that have a rating of more than 3 **(5 Marks)**

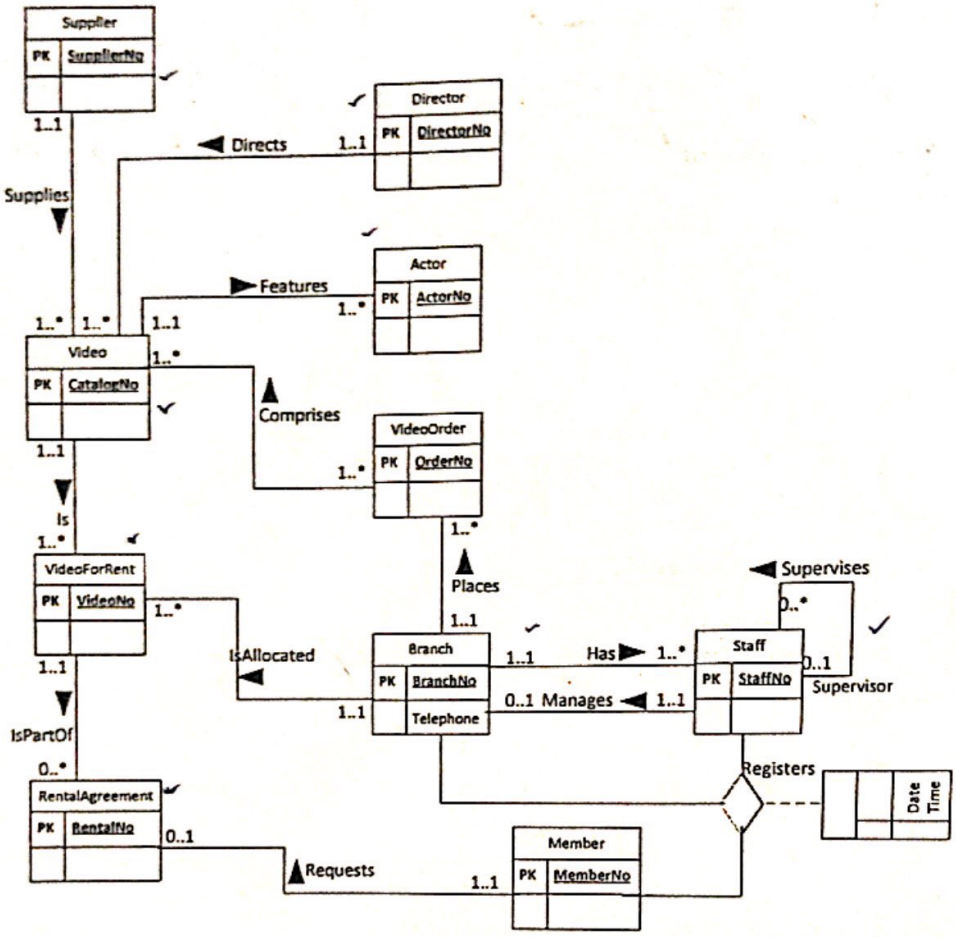
b) Give the output of the following SQL statements **(3 Marks)**

i)
```
SELECT reviewer_name, content, rating
FROM BookReviews
WHERE book_id = (SELECT book_id FROM Book WHERE title = "My
Second SQL Book");
```

ii) **(3 Marks)**
```
SELECT book_id, count(user_id)
FROM CheckOuts
Group BY book_id;
```

Question 2

Study the ERD below and derive the relations in the logical database design of the StayHome Video Library. **(20 Marks)**



Question 3

Draw an EERD for the railway reservation system that facilitates the passengers to enquire about the trains available based on source, destination, and booking tickets. The aim of this case study is to design a database maintaining the records of different trains, train status, and passengers. The record of train includes its number, name, source, destination, days on which it is available, and the train status (available_seats, and booked_seats). A Passenger books a train in which seats are available. When booking, a ticket is generated with a ticketID, the desired train number, and the date to travel. Passenger details include nationalID, fullname, and contact. A Passenger makes a payment. Payments can either be; cash, card or MobileMoney. If a credit card is used, the credit_limit of the card is captured. The amount paid, the date on which a payment was made, and a paymentCode are recorded for each payment. Each train is allocated to a particular route, although some routes may have several trains. Each route passes through a number of towns, and a town can be on different routes. A town is identified by a townCode, and has a name, district. One or more drivers are allocated to a particular route, and a driver to a route. Each route is identified by a route number. Drivers have an employee

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number, name, address, and a telephone number. (20 **Marks)**

Question 4

Consider the unnormalized CheckOut Table below with Primary Key (id, isbn, checkout_date). Identify any partial dependencies and normalize it to the 3NF. **(20 Marks)**

ID	Full_Name	Enabled	Last_login	Title	Author	Published_Date	ISBN	Checkout_date	Return
1	John Smith	No	2017-10-25 10:26:10.0	My first SQL book	Mary Parker	2012-02-22 12:08:17	98148302	2017-10-15 14:43:18	
1	John Smith	No	2017-10-25 10:26:10.0	My second SQL book	John Mayer	1972-07-03 09:22:45	85730092	2017-10-05 16:22:44	2017-10-13 13:15:12
2	Alice Walker	True	2017-10-25 10:26:50.2	My second SQL book	John Mayer	1972-07-03 09:22:45	85730092	2017-10-15 11:11:24	2017-10-22 17:47:10
3	Jane Smith	True	2017-10-25 10:36:43.3	My third SQL book	Cory Flint	2015-10-18 14:05:44	52312096	2017-10-15 09:27:07	

CheckOut Table