PART A: STRUCTURED QUESTION **(80 MARKS)**

QUESTION 1 (15 MARKS)

United Book Sdn. Bhd is an expanding bookstore company and has been keeping information of their staff, customer and stock (book) in a manual Excel file. As the new database administrator in United Book Sdn. Bhd., you have been asked to propose a new database system for the company. Figure 1 shows your proposed database system, which consist of the payroll, customer service and sales management system.

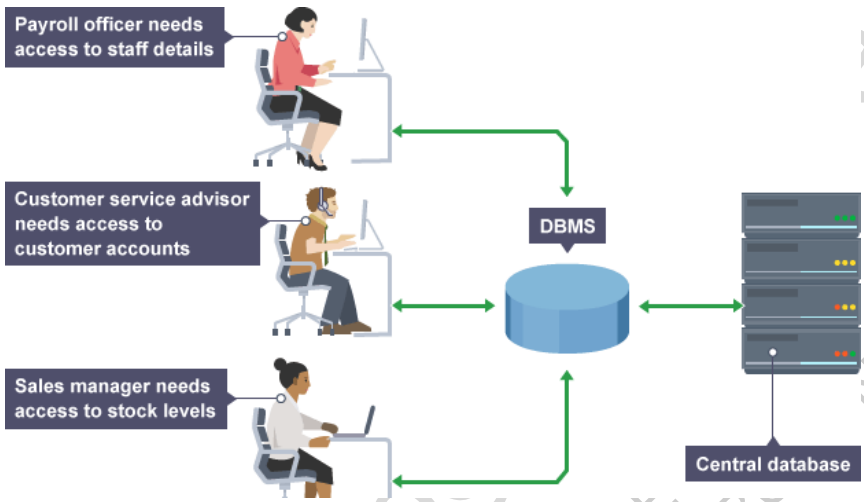


Figure 1: Database System for United Book Sdn. Bhd.

a) Explain your role as a database administrator.

(2 marks)

b) In your proposal, you were asked to explain why the existing file-based system is not relevant to the company anymore. List THREE (3) the limitation of the traditional file-based system.

(3 marks)

c) Based from Figure 1, explain (based on your assumptions):
   i. user
   ii. application program
   iii. Database Management System (DBMS)
   iv. database

(8 marks)

d) What is the EXTERNAL LEVEL in the ANSI-SPARC Three Level Architecture (use Figure 1 for your example)?

(2 marks)

QUESTION 2
RELATIONAL MODEL (20 MARKS)

a) Table 1 shows a table for a database. Answer ALL questions below:

i. Identify the following: Relation, Attribute, Tuple, Primary Key.

Patient Id	Name	D.o.B	Gender	Phone	Doctor Id
134	Jeff	4-Jul-1993	Male	7876453	01
178	David	8-Feb-1987	Male	8635467	02
198	Lisa	18-Dec-1979	Female	7498735	01
210	Frank	29-Apr-1983	Male	7943521	01
258	Rachel	8-Feb-1987	Female	8367242	02

ii. What is the cardinality and degree of Table 1?

b) The following table is part from a database in a relational DBMS:

i. Identify primary key for AIRPORT and FLIGHT. (2 marks)

ii. Identify foreign key(s) in Figure 2. (3 marks)

iii. Does the relations exhibit ENTITY INTEGRITY? Give explanation for each relation. (5 marks)

iv. Does the relation exhibit REFERENTIAL INTEGRITY? Give explanation for each relation (Write NONE for the relation that did not show integrity constraint). (4 marks)

QUESTION 3 (15 MARKS)

Answer all questions based on Table 1 and Table 2:

Table 1: Staff Relation

StaffNo	StaffName	Department	Salary
1234	Farihah Wahid	Information System	4,200
1422	Fatimah Mahmud	Software Engineering	3,800
1667	Alex Davidson	Information System	3,200
2329	Aneesa Arsyad	Computer Science	4,200
3236	Faris Iskandar	Computer Science	4,500
4255	Afham Ismail	Information System	4,000
5454	Elyana Firdaus	Software Engineering	3,500

Table 2: Course Relation

StaffNo	CourseNo	CourseName	CourseDate
1234	AC007	Mobile Application	19/9/2016
1234	AC177	R Programming	17/10/2016
1422	AC110	Data Mining	12/10/2016
1667	AC177	R Programming	17/10/2016
1667	AC017	Web and Application Development	16/11/2016
2329	AC110	Data Mining	12/10/2016
2329	AC017	Web and Application Development	16/11/2016
3236	AC177	R Programming	17/10/2016
3236	AC017	Web and Application Development	16/11/2016
4255	AC110	Data Mining	12/10/2016
4255	AC177	R Programming	17/10/2016
5454	AC007	Mobile Application	19/9/2016

a) Answer the questions in Relational Algebra:

i. Find all staffs from 'Software Engineering' or 'Computer Science' departments.

(2 marks)

ii. List the CourseName where there are staff from 'Information System' department attended.

(3 marks)

iii. Produce a list of CourseNo and CourseName that held in October.

(3 marks)

iv. Find the details of staff taking the 'Web and Application Development' course.

(3 marks)

3(b) Create the virtual table that contains the data in Table 1 and 2 that would be produced by the following Relational Algebra operations:

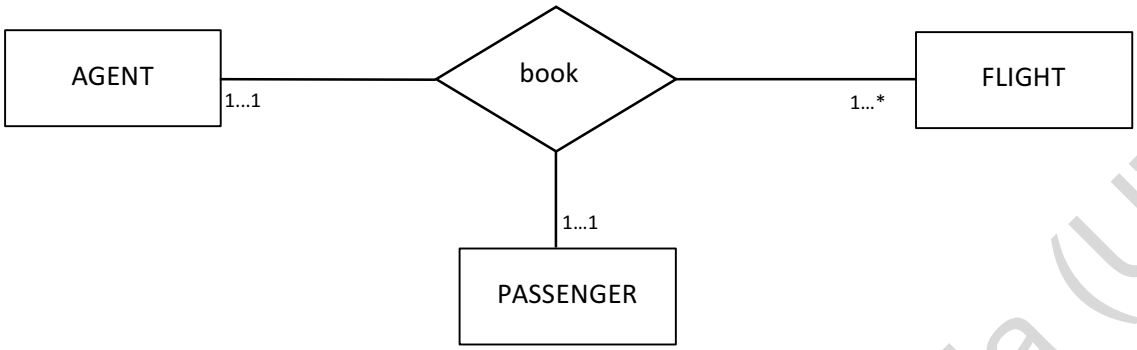
(i) $\Pi_{\text{StaffName, Department}}(\sigma_{\text{Salary} > 4{,}000}(\text{Staff}))$ (1.5 Marks)

(ii) $(\Pi_{\text{StaffNo, CourseDate}}(\sigma_{\text{CourseName} = \text{'R programming'}}(\text{Course}))) \bowtie ((\sigma_{\text{Department} = \text{'Information System'}}(\text{Staff}))$ (2.5 Marks)

QUESTION 4 (10 MARKS)

a) Write business rules for each Entity Relationship Diagram (ERD)

a.



(2 marks)

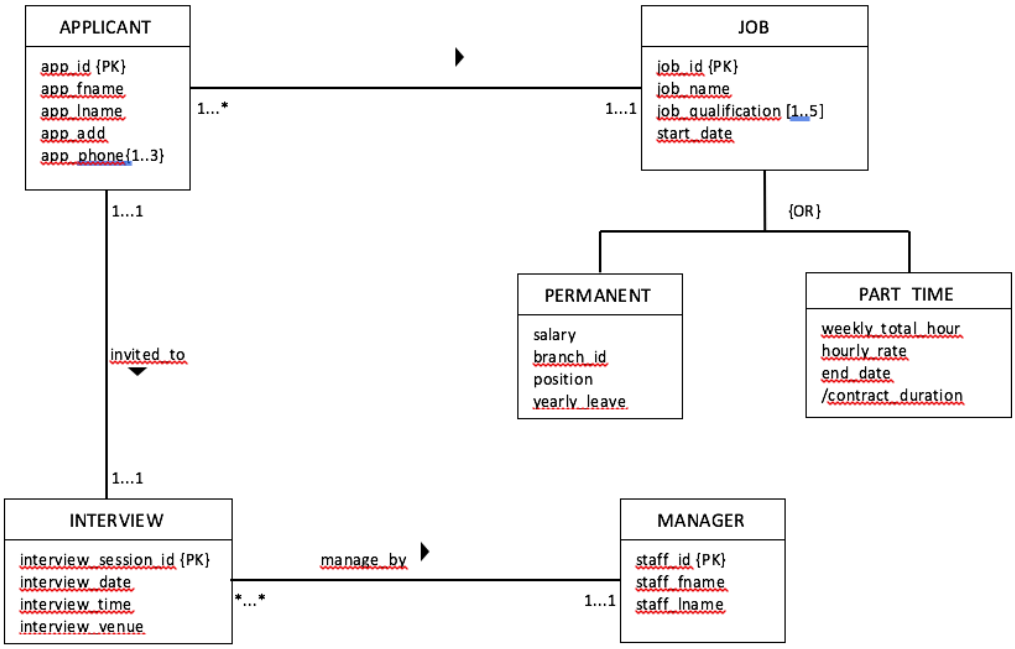
b.

(3 marks)

treats

b) Figure 2 shows an ERD with errors. Circle and describe ALL the errors.
Write your answer in APPENDIX 1 paper, detach the page and send together with your answer booklet.

(5 Marks)



PART B: CASE STUDY QUESTION **(40 MARKS)**

1. Create a database for a library name JOHOR_LIBRARY (1 Mark)

2. Create the tables in the JOHOR_LIBRARY database. Details of each table is given below. Include the constraints when creating the tables.

(1 Mark)

ATTRIBUTE	DATATYPE
book_ID (Primary Key)	VARCHAR2 (5)
title (requires value)	VARCHAR2 (30)

Table 1: Relation BOOK

(1.5 Marks)

ATTRIBUTE	DATATYPE
book_ID (Primary key. References book_ID from Relation BOOK)	VARCHAR2 (5)
author_name (Primary key . Requires value)	VARCHAR2 (30)

Table 2: Relation BOOK_AUTHORS

(2 Marks)

ATTRIBUTE	DATATYPE
book_ID (Primary key. References book_ID from relation BOOK)	VARCHAR2 (5)
branch_ID (Primary key. References branch_ID from relation LIBRARY_BRANCH. Requires value)	VARCHAR2 (5)
no_of_copies (requires value)	INTEGER

Table 3: Relation BOOK_COPIES

(1.5 Marks)

ATTRIBUTE	DATATYPE
card_no (Requires value)	VARCHAR2 (8)
name (Requires value)	VARCHAR2 (30)
address (Requires value)	VARCHAR2(40)
City	VARCHAR2 (20)
phone	INTEGER

Table 4: Relation BORROWER

3. Alter the table
    a. Add constraint to the table BORROWER named borrower_cardno_pk to create the attribute name as the primary key . (2 Marks)

    b. Delete the column city from the table BORROWER. (1 Mark)

    c. Modify column the column phone from table BORROWER to type varchar2 with a length of 10. (1 Mark)

4. Create a copy of the table
    a. Create a copy of the table BOOK_COPIES and name it BOOK_LOANS (1.5 Marks)

    b. Delete the column no_of_copies from the table BOOK_LOANS. (1 Mark)

    c. Add the columns card_no, date_out and due_date to the table BOOK_LOANS. (2 Marks)

    d. Add the constraint for table BOOK_LOANS to create the primary key which consists of the set book_id, and card_no. Name the constraint book_loans_pk. (2 Marks)

5. Insert data into table BORROWERS from an old table named OLD_BORROWERS of all borrowers who lives in SKUDAI. Assume the structure of both tables are the same. (2 Marks)

6. The branch named Nusajaya has changed their name to Iskandar Puteri. Update their record in the table LIBRARY_BRANCH. The LIBRARY_BRANCH has the attributes branch_ID, branch_name and address. (1.5 Marks)

7. Insert the value of a book that has been loaned. The values are:

book_id	=	B2345
card_no	=	J4567
date_out	=	the current time
due_date	=	11 November 2017

(2 Marks)

8. Delete the records of all book authors that whose third character of their name is the character 'M' from the table BOOK_AUTHORS. (2 Marks)