| Mansoura University | | Department: Computers Engineeri And Systems<br>Total Marks: 90 Marks | Faculty of Engineering |
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|---|---|---|
| Course Title: Database 1 | Course Code: CSE 3313 | Year: 3rd |
| Date: Jan, 15 2012 (First term) | Allowed time: 3 hrs | No. of Pages: (2) |

**Remarks: (Answer the following questions… assume any missing data )**

**Question No. (1) 3 points each (15 Marks)**

**Q1-A)** State the main Functions of DBMS, then draw figure that depicts the DBMS components?

**Q1-B)** List Advantages of DBMSs in the case of using Flat file system DBS model?

**Q1-C)** **State** the most important function of the DBMS for each one specify its corresponding level in the 3 level Architecture

**Q1-D)** List the different ways of implementation of the Client/Server Architecture?

**Q1-E)** Specify the value of the next terms (Degree – Cardinality) for the following DB models (Hierarchical – Network - OO)

**Question No. (2) 5 points each (20 Marks)**

**Q2 -A)** Convert the relational algebra expression R∩S into SQL, with the constraint that the RDMBS you are using does not support the SQL commands INTERSECT and EXCEPT. You may use commands such as IN, EXISTS, and NOT, if you need to.

**Q2 -B)** Assume that we have two relations, M, and N

(i) The relation MN is resulted from Joining M with N which of the following expression is right (write the correct answer)

- Cardinality of MN ≤ Cardinality of M ||Cardinality of N
- Degree of MN ≥ Degree of M && Degree of N

(ii) Repeat (i) while the relation MN is resulted from Union M with N

**Q2 -C)** Write SQL statement that Delete an only one record form the Relation X

**Q2 -D)** Write SQL statement that Delete an only one Column form the Relation X

**Question No. (1) (42 Marks)**

**Q3 -A)** **4 point** We are given a schema R(X) with key K ϵ X. Suppose that A,B,C ϵ X are non-key attributes and we want to verify that the functional dependency A,B →C is not violated in our database. Consider the SQL query,

```
Select S.K, T.K as K1, K2
From R as S, R as T
Where S.A = T.A and S.B = T.B and S.C <> T.C
```

Does this query return all key pairs of records that violate the functional dependency?

(i) when C is not allowed to be NULL? [3 marks]

(ii) when C is allowed to be NULL? [3 marks]

**Q3 -B)** **8 point each** Is the following Relation is not in the normal form, apply normalization steps to convert it in normal form: assuming the following assumption

| | |
|---|---|
| **PK = C_id + P_num** | **c_id + p_num** ⟶ r_start, r_end |
| **c_id** ⟶ c_name | **p_num** ⟶ p_address, city, state, zip, rent, owner_num, owner |

| c_id | p_num | c_name | p_address | city | state | zip | r_start | r_end | rent | owner_num | owner |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | pr3<br>pr22 | Jane Doe | 123 Elm St<br>246 Pine St | Ely<br>Elko | NV<br>NV | 11111<br>11112 | 1-1-96<br>2-1-98 | 12-1-98<br>3-30-00 | 785<br>1200 | po23<br>po44 | Ike Jones<br>Jan Perez |
| 02 | pr17 | Fred Fish | 321 Oak St | Ely | NV | 11111 | 2-1-88 | 1-11-90 | 1000 | po32 | Jill Ames |
| 03 | pr32<br>pr22 | Ed Smith | 511 2nd St<br>246 Pine St | Ely<br>Elko | NV<br>NV | 11111<br>11112 | 6-1-90<br>4-1-00 | 3-1-95<br>Present | 950<br>1400 | po32<br>po44 | Jill Ames<br>Jan Perez |

**Q3 -D)** Consider the following schema for an airline database (primary key attributes are in **bold**):

FLIGHTS (**flight_num**, source_city, destination_city)

DEPARTURES (**flight_num, date,** plane_type)

PASSENGERS (**passenger_id**, passenger_name, passenger_address)

BOOKINGS( **passenger_id, flight_num, date**, seat_number)

**[2 points each ]Write RA expression statements to :**

(I) Find the cities that have direct (non-stop) flights to both Honolulu and Ne ..rk.

(II) Find the passenger_name of all passengers who have a seat booked on at least one plane of **every** type.

**(III)** Find the flight_num and date of all flights for which there are no reservations.

**[2 points each ] Write SQL expression statements to :**

(I) Find the cities that have direct (non-stop) flights to both ALX and Cairo

**(II)** Find the passenger_id of all passengers who have a seat booked on a plane of type ``747" from San Francisco to Washington. **Do not return any duplicate values.**

**(III) )** Find the passenger_name of all passengers who have a seat booked on at least one plane of **every** type.

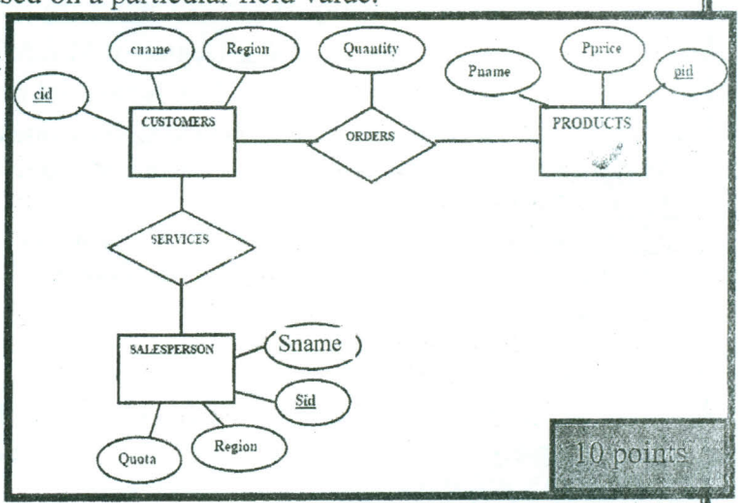
**Q3-E) [8 ps]**The main components of the cost of performing a disk read are **seek time, rotational delay**, and **transfer time** . For each of these three components state whether or not it is reduced by doing **sequential** reads rather than **random** reads*: Then state which* of the three is likely to result in the largest savings when comparing sequential reads to random reads? (No explanation necessary)

| **Component** | reduced by **sequential** *YES or NO* |
|---|---|
| Seek Time | |
| **rotational delay** | |
| **transfer time** | |

**Q3 -F) Which of the** basic file organization (heap, sorted, or hash) that is best for a large file where the most frequent operations are as follows (answer each separately – no explanation needed): 1) Search for records based on a range of field values.2) Perform inserts and scans where the order of records does not matter.3) Search for a record based on a particular field value.

**Question No. (1) (30 Marks)**

**Q4 -A)** You have just been hired as a consultant for a large company Impressed by your background in databases; they want you to complete the design of their database system based on the following E/R Diagram Find the suitable schema.




10 points

**Q4 -B)** For the previous Database, name one advantage of building a clustered index on the Sname field of the SALESPERSON table Name one disadvantage. Under what circumstances would a nonclustered index on the Sname field be the best choice?

**Q4 -C)** Consider the following relation schema:

UserProfiles(UserId, PasswordHash, RealName, ZipCode, Preferences, Avatar, LoginStatus) – PrimaryKey(UserID)

Friends(UserId1, UserId2)

Posts(UserId, Topic, Subject, Text, Date)

12 points

The most frequent operations against this database are:

i. Users log in, requiring a lookup of UserProfiles, at a rate of 1,000 per second

ii. Users check to see the LoginStatus of their friends, requiring a join of Friends and UserProfiles, at a rate of 10,000 per second

iii. New users are added to UserProfiles, at a rate of 1 per second

iv. Users enter new posts, inserting tuples into Posts, at a rate of 100 per second

v. Users view the subjects of the posts for a topic on a given day, at the rate of 1,000 per se nd

a. If we only create one index for UserProfiles, what should the index be on? Why? Should it be clustering?

b. Should we create an index for Posts? If so, what attribute or attributes should it be on? If multiple attributes, what order should they be in? If we should not create an index, why not?

**Q2-B) [10 points] Rewrite the program segment using a while loop:**

```
int i, n=5, sum=0;
for (i = 0; i < n; i++)
{
  sum = sum + i*2+1;
  Console.WriteLine(i+" "+sum);
  if (sum > 10) break;
}
```

**Q2-C) [3 points] Write a program to print the numbers 1, 101 and 1001**

**Q2-D) [3 points]Write a C# program to calculate and print out Sum, Where:**
**Sum = 1+3+5+7+……+97+99.**

**Q2-E) Write a program to read your age from the console and print how old you will be ter 10 years.**

**Q2-E) Write a program that prints the first 10 members of the sequence: 2, -3, 4, -5, 6, , ...**

**Question No. (2) (25 Marks)**

**Q3-A) [3 points] Write a program that reads the radius r of a circle and prints its erimeter and area.**

**Q3-B) [3 points] Write a program that allocates array of 20 integers and initializes each lement by its index multiplied by 5. Print the obtained array on the console.**

**Q3-C) [3 points] Write a C# program to read a number x and calculate its factorial.**
**Hint: factorial (x ) = 1*2*3*…* (x -2) * (x -1) * x**

**Q3-D) [3 points] Write a C# program to calculate and print out Sum, Where:**
**Sum = 2+4+6+8+……+98+100.**

**Q3-E) [3 points]Write a C# program to read 5 numbers from the user, and then find he maximum number among them.**