1. Answer the following two questions for the EER diagram given:

(a) (10 points) Extend the following EER diagram to include individual player scores plying for a team in a game (e.g., soccer), team scores in a game with no individual player scores (e.g., American football), and individual player scores in a game with no team scores (e.g., golf).

(b) (5 points) Give relation schemas (table definitions) for the extended EER diagram that you have created above. You do not have to specify Domain types.
2. (a) Write the following queries in SQL:
   
i. (5 points) Get the names of those players who have played in some games played by his/her team.

   ii. (5 points) Get team id’s of those teams whose average player scores (i.e., average scores of all players in a game) per game is above 3.

3. (10 points) Give an example of an object schema for a SPORTS database with the following features. Use graphical representation for your answer:

   (a) One interface class IF

   (b) Three classes A, B and C. A and B are subclasses of the interface class IF. C is a subclass of both A and B (multiple inheritance). A redefines an inherited attribute and C inherits an attribute from both A and B with the same origin.
4. Assume the Project-Task object-database schema diagram attached at the end for this exam:

(a) (5 points) Write in plain English what the following OQL statement achieves.

```
Select P.project_name, P.objective, P.sub_project, P.balance()
Documents: (Select D.acronym_document, D.name, D.classification
From P.Documents D )

Tasks: (Select T.date_start, T.date_end, T.description_task,
T.participating.group_name, T.leader,
Members: (Select M.name, M.specialization, M.salary,
M.production, M.average_salary,
M.monthly_salary()
From T.participating.members M)

From P.workplan T )
```

```
from Project P, P.work_plan T
where EXISTS (Select * from Article A, A.author Au
where Au=T.leader)
```

(b) (5 points) Give OQL statement for the following query:

Get all project names for those projects which have project document "database" and at least one of the tasks with project leader "John R".
5. Answer the following question for Oracle Object-Relational database.

(a) (5 points) Define an object-relational schema, using nested tables, for the following entity set:
Students(sid, addresses, TelNo)
sid is the student ID, addresses and TelNos are multi-valued.

(b) Consider the following SQL statement:

```
Select *
From THE(Select addresses
            From Students S
            Where S.sid=1234) A
Where A.city= "East Lansing"
```

i. (5 points) What does the keyword THE accomplishes?

ii. (5 points) Give the meaning of the above SQL statement in plain English.

(c) (5 points) Give an SQL statement for inserting telephone number 517-333-3333 into the nested table (tiny table) for the student with sid=1234.
6. Consider the following temporal relation where each valid start and end time is stored in separate rows of the table. Thus, start and end time is a part of the key.

### Prescription Table:

<table>
<thead>
<tr>
<th>Name</th>
<th>Drug</th>
<th>Physician</th>
<th>Vst</th>
<th>Vet</th>
</tr>
</thead>
<tbody>
<tr>
<td>n1</td>
<td>d1</td>
<td>p1</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>n1</td>
<td>d2</td>
<td>p2</td>
<td>20</td>
<td>28</td>
</tr>
<tr>
<td>n1</td>
<td>d2</td>
<td>p2</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>n1</td>
<td>d3</td>
<td>p2</td>
<td>30</td>
<td>35</td>
</tr>
<tr>
<td>n1</td>
<td>d1</td>
<td>p1</td>
<td>29</td>
<td>36</td>
</tr>
</tbody>
</table>

(a) (5 points) Write the table as a TSQL2 table where a temporal element is a set of maximal non-overlapping intervals.

(b) (10 points) Give the TSQL2 table resulting from the following TSQL2 statement.

```sql
SELECT Name
FROM Prescription
```

(c) (5 points) Give only the affected and the newly created tuples of the above temporal relation Prescription after the following UPDATE transaction is executed.

Transaction:

```sql
UPDATE Prescription
SET physician TO 'P1'
VALID PERIOD '20,28'
WHERE Name='n1' AND Drug = 'd2'
```
(d) Consider the following TSQL2 statement:

```sql
SELECT SNAPSHOT P1.Name, VALID(P1)
FROM Prescription(Name, Drug) AS P1, P1(Drug) AS (PERIOD) P1',
     Prescription(Name, Drug) AS P2, P2(Drug) AS (PERIOD) P2'
WHERE P1.Name=p2.Name & P1.Drug != P2.Drug & VALID(P1)=VALID(P2) &
    CAST(VALID(P1') AS INTERVAL MONTH)> INTERVAL '6' MONTH &
    CAST(VALID(P2') AS INTERVAL MONTH)> INTERVAL '6' MONTH
```

i. (5 points) Is VALID(P1) a set of time intervals or a single time interval?

ii. (5 points) If PERIOD is omitted from the above statement will VALID(P1) be a set of time intervals or a single time intervals. When PERIOD is omitted, will SNAPSHOT be able to create a table. Explain your answer.

iii. (5 points) Describe in plain English the meaning of the above TSQL2 statement.

7. (a) (10 points) What are fact tables, dimension tables, summary tables and summary delta tables in data-warehousing applications. Why are summary tables implemented as materialized views? Why are summary tables updated through summary delta tables and not directly?
(b) (10 points) Define an Oracle trigger that inserts the attribute values (storeID, itemID, AVGSale) into the positive delta table defined for the following summary table TotalSale(storeID, itemID, AVGsale) when a tuple is inserted into the following fact table. pos(storeID, itemID, date, qty, price)

AVGSale is average of all sales for an item. Thus, the AVGSale can be computed as (old-average-sale*old-count+qty*price)/(old-count+1). You need to store old-average-sale and old-count in a table. You may store these two values in a table SAVE(storeID, itemID, old-Count, old-average-sale) and update them as appropriate.