Suggested Solutions for Mid-Term

Consider the following relational model for a basketball league:

- Player (PlayerID, PName, Position, TeamID)
- Team (TeamID, TName, Venue)
- Game (GameNo, HomeTeamID, AwayTeamID)
- Record (GameNo, PlayerID, Points)

In this basketball league, each team has a unique name and each player plays for only one team. One team has at least 10 players. Two teams (home team versus away team) participate in each game at home team's venue. A team meets each of other teams twice (i.e., double round-robin tournament), one time as home team and the other time as away team. For each game, the league records the number of points scored by each player. If a player played for a game but did not score any point, there is a record for the player with zero point. If a player did not play for a game, there is no record for this player for that game (i.e., no record in the Record relation).

Please answer all the following questions based on the provided relational model and information for the basketball league.

Question 1. Write a relational algebra that returns the PlayerID and PName of players who played for at least one game. [10 marks]

You should type notations of relational algebra as depicted in the following table.

Notations	Typing
σ	[S]
π	[P]
*	*
⋈	[J]
←	<=
ρ	[R]

Suggested Solution 1:

$[P]_{PlayerID,\ PName}$ (Record * Player)

(There could be some other correct solutions.)

Question 2. Write a relational algebra that returns the GameNo, venue of the home team (renamed it as HomeTeamVenue) and venue of the away team (renamed it as AwayTeamVenue. [10 marks]

You should type notations of relational algebra as depicted in the following table.

Notations	Typing
σ	[S]
π	[P]
*	*
⋈	[J]
←	<=
ρ	[R]

Suggested Solution:

Tmp <= [P] $_{\text{GameNo, Venue, AwayTeamID}}$ (Game [J] $_{\text{HomeTeamID=TeamID}}$ Team)
Tmp2 <= [R] (GameNo, HomeTeamVenue, AwayTeamID)(Tmp)
Tmp3 <= [P] $_{\text{GameNo, HomeTeamVenue, Venue}}$ (Tmp2 [J] $_{\text{AwayTeamID=TeamID}}$ Team)
Result <= [R] (GameNo, HomeTeamVenue, AwayTeamVenue)(Tmp3)

("Result <=" is not necessary)

(There could be some other correct solutions.)

Question 3. Write a relational algebra that returns the PName of all players who scored more than 40 points in a game. [10 marks]

You should type notations of relational algebra as depicted in the following table.

Notations	Typing
σ	[S]
π	[P]
*	*
⋈	[J]
←	<=
ρ	[R]

Suggested Solution 1:

[P] $_{\text{PName}}$ (Record [J] $_{\text{PlayerID=PlayerID AND Points > 40}}$ Player)

Suggested Solution 2:

Tmp <= [S] $_{\text{Points > 40}}$ (Record)
Result <= [P] $_{\text{PName}}$ (Tmp [J] $_{\text{PlayerID=PlayerID}}$ Player)

("Result <=" is not necessary)

(There could be some other correct solutions.)

Question 4. Write a single SQL statement to retrieve the GameNo, TeamID and the number of players played for the team in each game. [10 marks]

Suggested Solution:

```
SELECT GameNo, TeamID, COUNT(*)
FROM Record, Player
WHERE Record.PlayerID=Player.PlayerID
GROUP BY GameNo, TeamID;
```

(There could be some other correct solutions.)

Question 5. Write a single SQL statement to retrieve the GameNo, PlayerID, and PName of all players who scored the highest points in a game. The results are sorted by GameNo and PlayerID in acceding order. [10 marks]

Suggested Solution:

```
SELECT GameNo, Player.PlayerID, PName
FROM Player, Record R1
WHERE Player.PlayerID=R1.PlayerID AND Points = (SELECT MAX(Points) FROM Record
R2 WHERE R1.GameNo=R2.GameNo)
ORDER BY GameNo, PlayerID;
```

(There could be some other correct solutions.)

Question 6. Write a single SQL statement to retrieve PlayerID and PName of all players whose names are five characters long, begin with letter P and end with letter r. [10 marks]

Suggested Solution:

```
SELECT PlayerID, PName
FROM Player
WHERE PName LIKE 'P___r';
```

('P___r' has 3 underscores.)

(There could be some other correct solutions.)

Question 7. Write a single SQL statement to retrieve the GameNo in which more than one player scored the highest points in the game. The results are sorted by GameNo in acceding order. [10 marks]

Suggested Solution:

```
SELECT GameNo
FROM Record R1
WHERE Points = (SELECT MAX(Points) FROM Record R2 WHERE
R1.GameNo=R2.GameNo)
GROUP BY GameNo
HAVING COUNT(*) > 1
ORDER BY GameNo;
```

(There could be some other correct solutions.)

Question 8. Write a single SQL statement to retrieve the TeamID, PlayerID, and PName of all players who have not played for any game. [10 marks]

Suggested Solution:

```
(SELECT TeamID, PlayerID, PName
FROM Player)
MINUS
(SELECT TeamID, Player.PlayerID, PName
FROM Record, Player
WHERE Record.PlayerID=Player.PlayerID);
```

(There could be some other correct solutions.)

Question 9. Write a single SQL statement to retrieve the PlayerID and PName of all players who have played for only one game and scored the lowest points in that game. [10 marks]

Suggested Solution:

```
SELECT Player.PlayerID, PName
FROM Player, Record R1
WHERE Player.PlayerID=R1.PlayerID AND Points = (SELECT MIN(Points) FROM Record
R2 WHERE R1.GameNo=R2.GameNo) AND 1 = (SELECT COUNT(*) FROM Record
WHERE Record.PlayerID=Player.PlayerID);
```

(There could be some other correct solutions.)

Question 10. Write a single SQL statement to retrieve the PName of every pair of players who have the same PName but in different teams. Each PName must appear only once in the results. [10 marks]

Suggested Solution:

```
SELECT DISTINCT P1.PName
FROM Player P1, Player P2
WHERE P1.PlayerID <> P2.PlayerID AND P1.PName = P2.PName AND P1.TeamID <>
P2.TeamID;
```

(There could be some other correct solutions.)

-- The End --