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UNIVERSIDADE DE MACAU

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Course : (CISC3000) Introduction to Database system

Title : NBA statistics database design project

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Table of Contents :

A) Description of our chosen domain
B) Description to the database
C) ER diagram of the database
D) EER diagram of the database
E) DDL of tables, views, function and procedure
F) 10 ~ 15 Records of all tables (with screenshot)
G) 10 Queries of SQL

A) Description of our chosen domain

The NBA, or National Basketball Association, is a men's professional basketball league in North America. The league consists of 30 teams, with 29 teams in the United States and one team in Canada. The NBA is one of the four major professional sports leagues in the United States and Canada, and is widely regarded as the premier men's professional basketball league in the world. The NBA season runs from October to June, and includes regular season games, playoffs, and a championship series known as the NBA Finals. The NBA has a rich history of great players, teams, and moments, and the league continues to be a popular source of entertainment and inspiration for basketball fans around the world.

The NBA statistics database is designed to store information about players, teams, games, and statistics related to the NBA.

B) Description to the database

1) **Description of entities sets and attribute**

The entity sets in this database include Players, Teams, Games, Stats, Coaches, Drafts, and Awards. Each player entity has attributes such as player ID, first name, last name, position, height, weight, birthdate, team ID. Each team entity has attributes such as team ID, name, city, arena, founded year, and coach ID. Each game entity has attributes such as game ID, date, home team ID, away team ID, home team score, away team score and winning team ID. Each stats entity has attributes such as stat ID, player ID, game ID, points, rebounds, assists, steals, blocks, and turnovers. Each coach entity has attributes such as coach ID, first name, last name and team ID. Each draft entity has attributes such as draft ID, player ID, draft year, pick, and team ID. Each award entity has attributes such as award ID, award name, player ID, and award year.

2) **Description of relationship sets**

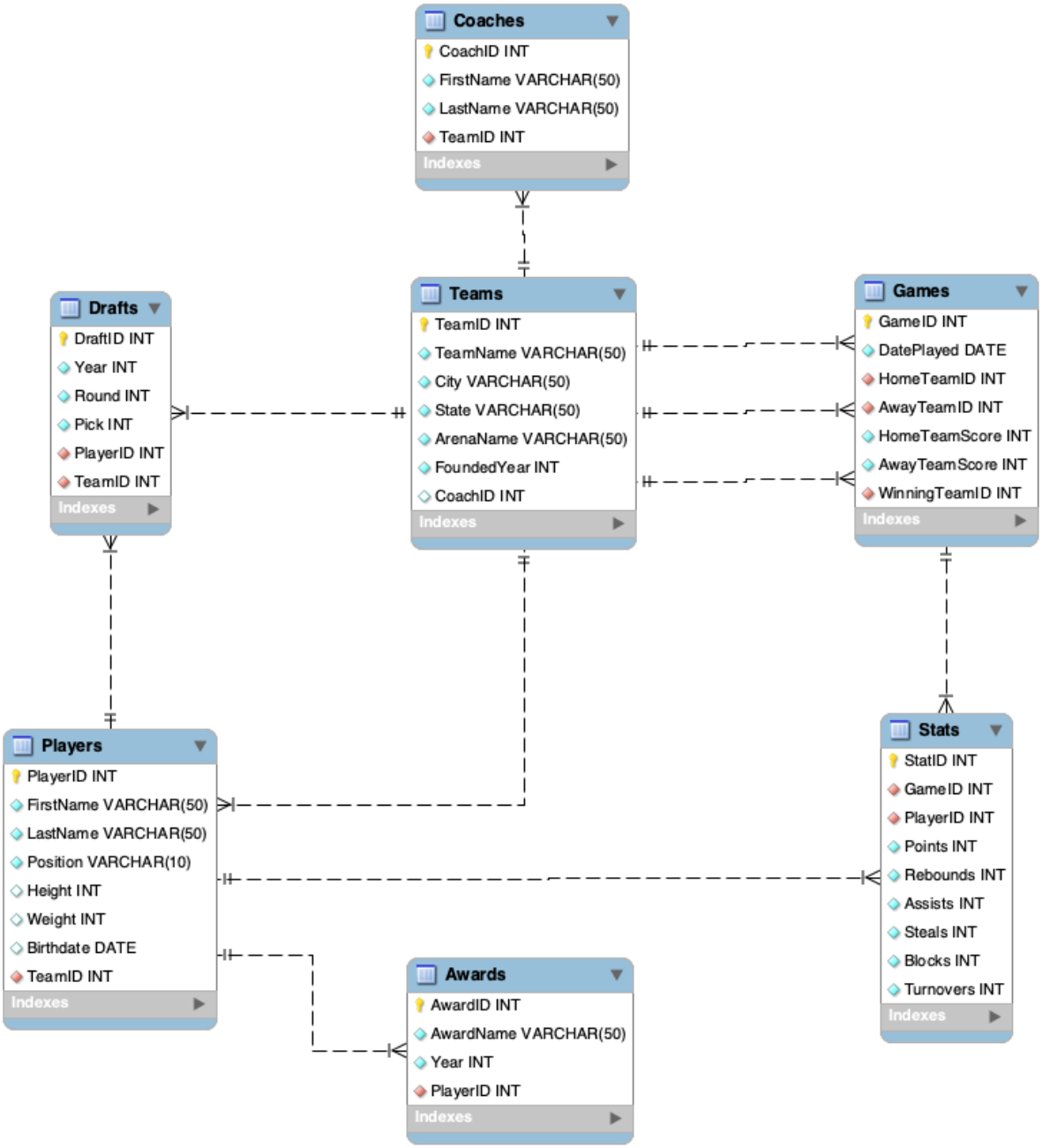
The relationships between the entity sets are established through foreign keys. For example, each player can belong to only one team, but each team can have multiple players. Each game involves two teams, and each player can have multiple stats for multiple games. Each team can have only one coach, and each coach can only belong to one team. Each draft pick can only belong to one team, and each team can have multiple draft picks. Each award can only be won by one player, and each player can win multiple awards.

3) **Description of Keys and Constraints**

Constraints such as unique keys and foreign keys are used to ensure data integrity in the database. For example, player ID is a unique key for the Players entity set, and team ID is a foreign key in the Players entity set. Similarly, game ID is a unique key for the Games entity set, and home team ID and away team ID are foreign keys in the Games entity set.

C) ER diagram of the database

D) EER diagram of the database



playerteamcoach

E) DDL of tables, views, function and procedure

1) DDL of tables

```
create database NBA
use NBA;

-- Create the Players table
CREATE TABLE Players (
    PlayerID INT PRIMARY KEY,
    FirstName VARCHAR(50) NOT NULL,
    LastName VARCHAR(50) NOT NULL,
    Height INT NOT NULL,
    Weight INT NOT NULL,
    Position VARCHAR(10) NOT NULL,
    Birthdate DATE NOT NULL,
    College VARCHAR(50) NOT NULL
);

-- Create the Teams table
CREATE TABLE Teams (
    TeamID INT PRIMARY KEY,
    TeamName VARCHAR(50) NOT NULL,
    City VARCHAR(50) NOT NULL,
    State VARCHAR(50) NOT NULL,
    ArenaName VARCHAR(50) NOT NULL,
    FoundedYear INT NOT NULL,
    CoachID INT
);


-- Create the Games table
CREATE TABLE Games (
    GameID INT PRIMARY KEY,
    DatePlayed DATE NOT NULL,
    HomeTeamID INT NOT NULL,
    AwayTeamID INT NOT NULL,
    HomeTeamScore INT NOT NULL,
    AwayTeamScore INT NOT NULL,
    WinningTeamID INT NOT NULL,
    FOREIGN KEY (HomeTeamID) REFERENCES Teams(TeamID),
    FOREIGN KEY (AwayTeamID) REFERENCES Teams(TeamID),
    FOREIGN KEY (WinningTeamID) REFERENCES Teams(TeamID)
);

-- Create the Stats table
```

```
CREATE TABLE Stats (
    StatID INT PRIMARY KEY,
    GameID INT NOT NULL,
    PlayerID INT NOT NULL,
    Points INT NOT NULL,
    Rebounds INT NOT NULL,
    Assists INT NOT NULL,
    Steals INT NOT NULL,
    Blocks INT NOT NULL,
    Turnovers INT NOT NULL,
    FOREIGN KEY (GameID) REFERENCES Games(GameID),
    FOREIGN KEY (PlayerID) REFERENCES Players(PlayerID)
);

-- Create the Coaches table
CREATE TABLE Coaches (
    CoachID INT PRIMARY KEY,
    FirstName VARCHAR(50) NOT NULL,
    LastName VARCHAR(50) NOT NULL,
    TeamID INT NOT NULL,
    FOREIGN KEY (TeamID) REFERENCES Teams(TeamID)
);

-- Create the Drafts table
CREATE TABLE Drafts (
    DraftID INT PRIMARY KEY,
    Year INT NOT NULL,
    Round INT NOT NULL,
    Pick INT NOT NULL,
    PlayerID INT NOT NULL,
    TeamID INT NOT NULL,
    FOREIGN KEY (PlayerID) REFERENCES Players(PlayerID),
    FOREIGN KEY (TeamID) REFERENCES Teams(TeamID)
);

-- Create the Awards table
CREATE TABLE Awards (
    AwardID INT PRIMARY KEY,
    AwardName VARCHAR(50) NOT NULL,
    Year INT NOT NULL,
    PlayerID INT NOT NULL,
    FOREIGN KEY (PlayerID) REFERENCES Players(PlayerID)
);
```

2) DDL of views

```
-- View to display player information along with their team name and coach name
CREATE VIEW PlayerTeamCoach AS
```

```
SELECT Players.PlayerID, Players.FirstName, Players.LastName, Players.Position,
Players.Height, Players.Weight, Teams.TeamName, Coaches.FirstName AS
CoachFirstName, Coaches.LastName AS CoachLastName
FROM Players
INNER JOIN Teams ON Players.TeamID = Teams.TeamID
INNER JOIN Coaches ON Teams.CoachID = Coaches.CoachID;
```

3) DDL of function :

```
-- Natural Language : Function to get player's average points per game
DELIMITER //
CREATE FUNCTION AvgPointsPerGame(InputTeamID INT)
RETURNS INT
DETERMINISTIC
BEGIN
    DECLARE AvgPoints INT;
    SELECT AVG(Points) INTO AvgPoints FROM Stats WHERE PlayerID IN (SELECT
PlayerID FROM Players WHERE TeamID = InputTeamID);
    RETURN (AvgPoints);
END;
```

4) DDL of procedure :

```
-- Natural Language : Procedure to update a player's height and weight
DELIMITER //
-- Procedure to update a player's height and weight
CREATE PROCEDURE UpdatePlayerHeightAndWeight(IN PlayerID INT, IN NewHeight INT,
IN NewWeight INT)
BEGIN
    UPDATE Players SET Height = NewHeight, Weight = NewWeight WHERE PlayerID =
PlayerID;
END
```

F) 10 ~ 15 Records of all tables (with screenshot)

1) Teams

TeamID	TeamName	City	State	ArenaName	FoundedYear	CoachID
1	Los Angeles Lakers	Los Angeles	California	Staples Center	1947	1
2	Golden State Warriors	San Francisco	California	Chase Center	1946	2
3	Boston Celtics	Boston	Massachusetts	TD Garden	1946	3
4	Chicago Bulls	Chicago	Illinois	United Center	1966	4
5	Houston Rockets	Houston	Texas	Toyota Center	1967	5
6	Philadelphia 76ers	Philadelphia	Pennsylvania	Wells Fargo Center	1949	6
7	Miami Heat	Miami	Florida	American Airlines Arena	1988	7
8	Brooklyn Nets	Brooklyn	New York	Barclays Center	1967	8
9	San Antonio Spurs	San Antonio	Texas	AT&T Center	1967	9
10	Dallas Mavericks	Dallas	Texas	American Airlines Center	1980	10
NULL	NULL	NULL	NULL	NULL	NULL	NULL

2) Players

PlayerID	FirstName	LastName	Position	Height	Weight	Birthdate	TeamID
1	LeBron	James	SF	206	113	1984-12-30	1
2	Stephen	Curry	PG	191	84	1988-03-14	2
3	Jayson	Tatum	SF	203	95	1998-03-03	3
4	Zach	LaVine	SG	198	91	1995-03-10	4
5	James	Harden	SG	196	100	1989-08-26	5
6	Joel	Embiid	C	213	127	1994-03-16	6
7	Bam	Adebayo	C	206	116	1997-07-18	7
8	Kevin	Durant	PF	208	109	1988-09-29	8
9	DeMar	DeRozan	SG	198	100	1989-08-07	9
10	Luka	Doncic	PG	201	104	1999-02-28	10
11	Anthony	Davis	PF	208	115	1993-03-11	1
12	Klay	Thompson	SG	198	98	1990-02-08	2
13	Jaylen	Brown	SG	198	101	1996-10-24	3
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

3) Games

GameID	DatePlayed	HomeTeamID	AwayTeamID	HomeTeamScore	AwayTeamScore	WinningTeamID
1	2023-04-15	1	2	105	98	1
2	2023-04-16	3	4	118	109	3
3	2023-04-16	5	6	88	91	6
4	2023-04-17	7	8	102	97	7
5	2023-04-18	9	10	95	101	10
6	2023-04-18	10	2	113	118	2
7	2023-04-19	1	4	90	92	4
8	2023-04-19	3	6	104	111	6
9	2023-04-20	1	3	112	115	3
10	2023-04-20	2	4	108	99	2
11	2023-04-21	5	7	98	99	7
12	2023-04-22	6	8	101	103	8
13	2023-04-22	9	5	121	113	9
14	2023-04-23	10	6	105	107	10
15	2023-04-23	9	3	84	96	3
NULL	NULL	NULL	NULL	NULL	NULL	NULL

4) Stats

StatID	GameID	PlayerID	Points	Rebounds	Assists	Steals	Blocks	Turnovers
1	1	1	24	5	3	1	0	2
2	1	2	16	10	2	0	2	1
3	1	3	8	4	1	2	0	3
4	1	4	10	6	2	0	1	1
5	2	5	20	8	2	0	2	3
6	2	6	14	6	3	1	1	2
7	2	7	6	3	1	0	0	1
8	2	8	10	4	2	2	0	1
9	3	9	18	10	4	1	2	3
10	3	10	10	4	3	0	1	1
11	3	11	6	2	2	0	0	2
12	3	12	4	2	1	1	0	0
13	4	13	22	12	3	1	3	2
14	4	1	14	8	1	0	1	2
15	4	2	10	2	4	2	0	1
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

5) Coaches

CoachID	FirstName	LastName	TeamID
1	John	Doe	1
2	Jane	Doe	2
3	Mark	Johnson	3
4	Susan	Smith	4
5	Mike	Wilson	5
6	Emily	Jones	6
7	David	Brown	7
8	Karen	Taylor	8
9	Tom	Anderson	9
10	Laura	Clark	10
NULL	NULL	NULL	NULL

6) Drafts

DraftID	Year	Round	Pick	PlayerID	TeamID
1	2020	1	1	1	1
2	2020	1	2	2	2
3	2020	1	3	3	3
4	2020	2	1	4	1
5	2020	2	2	5	2
6	2020	2	3	6	3
7	2021	1	1	7	1
8	2021	1	2	8	2
9	2021	1	3	9	3
10	2021	2	1	10	1
NULL	NULL	NULL	NULL	NULL	NULL

7) Awards

AwardID	AwardName	Year	PlayerID
1	MVP	2020	1
2	All-Star	2020	1
3	Rookie of the Year	2020	2
4	All-Star	2021	2
5	Defensive Player of the Year	2021	3
6	All-Star	2021	3
7	MVP	2021	4
8	All-Star	2021	4
9	Rookie of the Year	2021	5
10	All-Star	2021	5
NULL	NULL	NULL	NULL

G) 10 Queries of SQL

1) Find the name of the coach for each team: (natural language)

```
SELECT TeamName, FirstName, LastName
FROM Teams
JOIN Coaches ON Teams.CoachID = Coaches.CoachID;
```

TeamName	FirstName	LastName
Los Angeles Lakers	John	Doe
Golden State Warriors	Jane	Doe
Boston Celtics	Mark	Johnson
Chicago Bulls	Susan	Smith
Houston Rockets	Mike	Wilson
Philadelphia 76ers	Emily	Jones
Miami Heat	David	Brown
Brooklyn Nets	Karen	Taylor
San Antonio Spurs	Tom	Anderson
Dallas Mavericks	Laura	Clark

2) Find the number of games played by each team: (natural language)

```
SELECT TeamName, COUNT(GameID) AS NumGames
FROM Teams
JOIN Games ON Teams.TeamID = Games.HomeTeamID OR Teams.TeamID =
Games.AwayTeamID
GROUP BY TeamName;
```

TeamName	NumGames
Los Angeles Lakers	3
Golden State Warriors	3
Boston Celtics	4
Chicago Bulls	3
Houston Rockets	3
Philadelphia 76ers	4
Miami Heat	2
Brooklyn Nets	2
San Antonio Spurs	3
Dallas Mavericks	3

3) Find the average height of players on each team: (natural language)

```
SELECT TeamName, AVG(Height) AS AvgHeight_cm
FROM Teams
JOIN Players ON Teams.TeamID = Players.TeamID
GROUP BY TeamName;
```

TeamName	AvgHeight_cm
Los Angeles Lakers	207.0000
Golden State Warriors	194.5000
Boston Celtics	200.5000
Chicago Bulls	198.0000
Houston Rockets	196.0000
Philadelphia 76ers	213.0000
Miami Heat	206.0000
Brooklyn Nets	208.0000
San Antonio Spurs	198.0000
Dallas Mavericks	201.0000

4) Find the total number of points, rebounds, and assists for each player: (natural language)

```
SELECT FirstName, LastName, SUM(Points) AS TotalPoints, SUM(Rebounds) AS
TotalRebounds, SUM(Assists) AS TotalAssists
FROM Players
JOIN Stats ON Players.PlayerID = Stats.PlayerID
GROUP BY FirstName, LastName;
```

FirstName	LastName	TotalPoints	TotalRebounds	TotalAssists
LeBron	James	38	13	4
Stephen	Curry	26	12	6
Jayson	Tatum	8	4	1
Zach	LaVine	10	6	2
James	Harden	20	8	2
Joel	Embiid	14	6	3
Bam	Adebayo	6	3	1
Kevin	Durant	10	4	2
DeMar	DeRozan	18	10	4
Luka	Doncic	10	4	3
Anthony	Davis	6	2	2
Klay	Thompson	4	2	1
Jaylen	Brown	22	12	3

5) Find the names of players who have won the MVP award: (natural language)

```
SELECT FirstName, LastName
FROM Players
JOIN Awards ON Players.PlayerID = Awards.PlayerID
WHERE AwardName = 'MVP';
```

FirstName	LastName
LeBron	James
Zach	LaVine

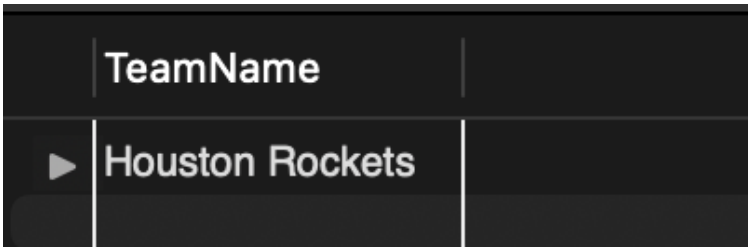
6) Find the name of the player who scored the most points in a game: (natural language)

```
SELECT FirstName, LastName, Points
FROM Players
JOIN Stats ON Players.PlayerID = Stats.PlayerID
WHERE Points = (SELECT MAX(Points) FROM Stats);
```

FirstName	LastName	Points
LeBron	James	24

7) Find the teams that have not won a game yet: (natural language)

```
SELECT TeamName
FROM Teams
WHERE NOT EXISTS (SELECT * FROM Games WHERE Teams.TeamID =
Games.WinningTeamID);
```



TeamName
Houston Rockets

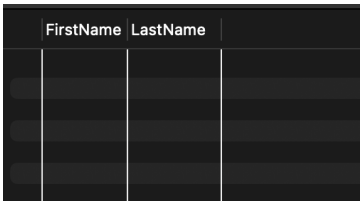
8) Find the teams that have won more than half of their games: (natural language)

```
SELECT TeamName
FROM Teams
JOIN Games ON Teams.TeamID = Games.HomeTeamID OR Teams.TeamID =
Games.AwayTeamID
GROUP BY TeamName
HAVING SUM(CASE WHEN Teams.TeamID = Games.WinningTeamID THEN 1 ELSE 0
END) > COUNT(*)/2;
```

TeamName
Golden State Warriors
Boston Celtics
Miami Heat
Dallas Mavericks

9) Find the players who have played for more than one team: (natural language)

```
SELECT FirstName, LastName
FROM Players
GROUP BY FirstName, LastName
HAVING COUNT(DISTINCT TeamID) > 1;
```



FirstName	LastName

(empty)

10) Find the players who were drafted in the first round: (natural language)

```
SELECT FirstName, LastName, Year, Round, Pick
FROM Players
JOIN Drafts ON Players.PlayerID = Drafts.PlayerID
WHERE Round = 1;
```

FirstName	LastName	Year	Round	Pick
LeBron	James	2020	1	1
Stephen	Curry	2020	1	2
Jayson	Tatum	2020	1	3
Bam	Adebayo	2021	1	1
Kevin	Durant	2021	1	2
DeMar	DeRozan	2021	1	3