National University of Computer and Emerging Sciences, Lahore Campus

Course:	**Advance Database Concepts**	**Course Code:**	**CS4064**
Program:	**BS (Computer Science)**	**Semester:**	**Spring 2023**
Out Date:	**26-Apr-2023**	**Total Marks:**	
Due Date:	**Thu 4-May-2023** ***(Start of class)***	**Weight:**	
Section		**Page(s):**	**1**
Assignment:	**4 (Query Optimization)**		

Instructions:

- *This assignment is an individual assignment.*
- *You are required to submit the hard copy of your assignment at the start of your class.*
- *Use any valid assumption where needed.*
- *For any query, please contact your TA.*

Q1. Consider the following part of database, and the SQL/RA query:

Student (RNo, FirstName, LastName, BirthDate, Gender, CGPA, BatchID, CampusID, DegreeID)
Course (CID, Title, CreditHours, CourseLevel, CourseType, OfferingDept)
Grade (Rollno, CourseID, LetterGrade, GPA, Semester, Year, LastUpdate)

```
SELECT S.RNo, S.FirstName, G.LetterGrade
FROM student S JOIN grade G ON S.RNo=G.RollNo JOIN course C ON C.CID=G.CourseID
WHERE S.CampusID = 'Lhr' AND C.Title='Advance Database Concepts';
```

$$\Pi_{\text{RNo, FirstName, LetterGrade}} (\sigma_{\text{CampusID = 'Lhr'} \wedge \text{Title='Advance Database Concepts'}} (\text{Student} \bowtie_{\text{RNo=RollNo}} \text{Grade} \bowtie_{\text{CourseID=CID}} \text{Course})$$

Your task is to optimize this query and draw the best possible query tree for this query. Take appropriate database statistics to support your answer, if needed.

Q2. Write an SQL query that includes at least four tables, two filter conditions, a group by clause, and a having clause. Write a relational-algebra expression that is equivalent to this query. Draw the best possible query tree for this query. Take appropriate database statistics to support your answer.