Databases

(a) Define the operators in the (core) relational algebra. [6 marks]

(b) The core relational algebra is often extended with other operators. For the following operators give a definition and an example of their behaviour:

(i) the full outer join operator; [3 marks]

(ii) the aggregate and grouping operator. [5 marks]

(c) $X, Y$ and $Z$ are all relations with a single attribute $A$. A naïve user wishes to compute the set-theoretic expression $X \cap (Y \cup Z)$ and writes the following SQL query.

```
SELECT X.A
FROM   X, Y, Z
WHERE  X.A=Y.A OR X.A=Z.A
```

(i) Give the relational algebra term that this query would be compiled to. [2 marks]

(ii) Does the SQL query satisfy the user’s expectation? Justify your answer. [4 marks]