

DBMS – ASSIGNMENT 1

M.Tech. (CS), First Year, 2026–2027

Deadline: August 15, 2026

Total: 5 marks

SUBMISSION INSTRUCTIONS

1. Submit all the solutions in a single file.
2. Naming convention for your submission file (assuming CS26xx is your roll number):
CS26xx-assign1 (.rtf, .docx, .doc, .pdf, .tex, etc.).
3. To submit a solution file (say CS26xx-assign1.pdf), ensure that it is not password protected and mail to <assignisik@gmail.com> with the subject line as follows:
DBMS M.Tech. (CS) 2026-28 CS26xx Assignment 1.

NOTE: All the solutions must be self-sufficient and to the point.

Q1. Suppose there exists a pair of relations $R_1(X, Y, Z)$ and $R_2(Y, Z, W)$ having $t_1 > 0$ and $t_2 > 0$ tuples, respectively. Consider that X, Y, Z and W take integer values only. Without making any further assumptions, find out the minimum and maximum possible number of tuples that may appear in the resulting relations provided by the following operations.

- (i) $\pi_{Y,Z}(R_1 \bowtie R_2)$
- (ii) $R_1 \bowtie_{R_1.Y > R_2.Y} R_2$
- (iii) $\pi_X(R_1 \bowtie \pi_{Y,Z}(R_2))$
- (iv) $R_1 - (\pi_{X,Y}(R_1) \bowtie (R_1 \div \pi_X(R_1)))$

Q2. Given the relations $R_1(X, Y, Z)$ and $R_2(Y, Z, W)$, prove or disprove that the following relational algebra expression returns an empty relation as a result:

$$\pi_X(R_1 \bowtie (\pi_{Y,Z}(R_2) - \pi_{Y,Z}(R_1 \bowtie R_2))).$$