6 Logic and Proof (LCP)

(a) Write brief notes on Satisfiability Modulo Theories (SMT). Explain how SMT works and what sort of problem it can solve. [4 marks]

(b) Outline the basic ideas behind Fourier-Motzkin variable elimination, demonstrating them by solving the following set of constraints:

\[
\begin{align*}
x + z & \geq 5 \\
y + z & \geq 5 \\
y - 2z & \geq -2 \\
x + y + z & \leq 7
\end{align*}
\]

[8 marks]

(c) Briefly describe an algorithm for constructing a Binary Decision Diagram (BDD) without first constructing the full binary decision tree. Illustrate your answer by constructing the BDD for \((P \lor R) \rightarrow (P \land (Q \oplus R))\), where \(\oplus\) denotes exclusive OR.

[8 marks]