**Databases**

(a) Suppose that \( R(A, B, C) \) is a relational schema with functional dependencies \( F = \{ A, B \rightarrow C, C \rightarrow B \} \).

(i) Is this schema in 3NF? Explain. [2 marks]

(ii) Is this schema in BCNF? Explain. [2 marks]

(b) Decomposition plays an important role in database design.

(i) Define what is meant by a *lossless-join decomposition*. [2 marks]

(ii) Define what is meant by a *dependency preserving decomposition*. [2 marks]

(c) Let \( R(A, B, C, D, E) \) be a relational schema with the following functional dependencies

\[
\begin{align*}
A, B & \rightarrow C \\
D, E & \rightarrow C \\
B & \rightarrow D
\end{align*}
\]

(i) What is the closure of \( \{A, B\}\)? [2 marks]

(ii) What is the closure of \( \{B, E\}\)? [2 marks]

(iii) Decompose the schema to BCNF in *two* different ways. In each case, are all dependencies preserved? Explain. [4 + 4 marks]