Choose 2 out of the following 3 subjects (A,B or C), for 15 point each.

Each element of the language of mirrored strings is made of a sequence of digits in the \{0,1\} alphabet and then the same sequence following it in reverse order.

Examples, represented as Prolog lists, include:

\[
[], [0,1,1,0], [1,0,1, 1,0,1], [0, 0] [1,1,1,0, 0,1,1,1] [0,1,1,0,0, 0,0,1,1,0]
\]

A) Prove that the language is not regular.

B) Write a Prolog DCG grammar that recognizes sequences in the language of mirrored strings on \{0,1\}, (represented as Prolog lists) in the language.

C) Write a Prolog program that builds a parse tree for the following grammar.

\[
\text{sentence} \rightarrow \text{subject}, \text{verb}, \text{object}.
\]

\[
\text{subject} \rightarrow \text{proper\_noun}.
\]

\[
\text{object} \rightarrow \text{art}, \text{adjs}, \text{moun}.
\]

\[
\text{adjs} \rightarrow \text{adjective}.
\]

\[
\text{adjs} \rightarrow \text{adjective}, \text{adjs}.
\]

After adding terminal symbols such that the following sentences are recognized by the grammar, test your program by building a parse tree for each of them.

\[
[\text{joe, drives, a, good, old, car}]
\]
\[
[\text{joe, has, a, dog}]
\]
\[
[\text{mary, has, a, cat}]
\]
\[
[\text{mary, drives, a, pink, car}]
\]

Is the language recognized by the grammar regular? If so, write a regular expression that describes it.