Q1) Write a pseudo code for the Genetic Algorithm, then trace it to illustrate how it solve 4-color mapping.

Q2) A) You have the following production rules:

\[
\begin{align*}
\text{If } C_1 \text{ or } C_2 \text{ then } C_4 & \quad (\text{nrev. } 0.5) \\
\text{If } e_1 \text{ and } e_2 \text{ and } e_3 \text{ then } C_1 & \quad (\text{rev. } 0.2) \\
\text{If } \neg(e_7) \text{ then } C_2 & \quad (\text{nrev. } 0.3) \\
\text{If } e_4 \text{ then } C_2 & \quad (\text{rev. } 0.9) \\
\text{If } C_3 \text{ then } C_2 & \quad (\text{rev. } 0.3) \\
\text{If } e_5 \text{ or } e_6 \text{ then } C_3 & \quad (\text{nrev. } 1.0)
\end{align*}
\]

Where \( e_1=0.2, e_2=0.15, e_3=0.5, e_4=0.8, e_5=0.25, e_6=0.25 \) and \( e_7=0.05 \), Find certainty value of \( C_4 \).

B) Write the program for How & Why explanation facilities in an expert system.

Q3) A) You have BAM NN with the following I/O (A, B) vectors, trace this NN to find the weight matrix then apply the input vector \((1 \ 0 \ 0)\).

\[
\begin{align*}
A_1 &= (1 \ 0 \ 0) & B_1 &= (0 \ 0 \ 1) \\
A_2 &= (0 \ 1 \ 0) & B_2 &= (0 \ 1 \ 0) \\
A_3 &= (0 \ 0 \ 1) & B_3 &= (1 \ 0 \ 0)
\end{align*}
\]

B) Write a pseudo code for BAM NN learning stage.

Q4) Write a complete program to parse the following sentences:

“\text{We will come from the great house by the red big bus at night.}”

“What are the solutions of these problems?”

Q5) A) Write a typical expert system to classify the PC Laptop (only 4 types), using backward chaining.

B) Write the subroutines for the GA operators (Selection, Crossover & Mutation), using any programming language.
Q6) Trace the following Back-Propagation NN with 2 iteration.
W1 = \[
\begin{bmatrix}
0.2 & 0.5 & 0.4
\end{bmatrix}
\]
W2 = \[
\begin{bmatrix}
0.3 & 0.4
\end{bmatrix}
\]
learning rate = 0.7