Q.1 Use Karnaugh maps to simplify the following Boolean function in:
(a) Sum-of-products, and
(b) Product-of-sums form.
\[
F = \overline{W} (\overline{X} Y + \overline{X} \overline{Y} + X Y Z) + \overline{X} \overline{Z} (Y + W)
\]
"don't care" = \(\overline{W} X (\overline{Y} Z + Y \overline{Z}) + W Y Z\)

Q.2 Use a Karnaugh map to simplify the following Boolean function, and implement the simplified expression using NAND gates:
\[
F = \overline{B} D + \overline{B} C + A B C D
\]
"don't care" = \(\overline{A} B D + A \overline{B} C D\)

Q.3 Using maps, simplify the following expressions, using sum-of-products form:
(a) \(A B C + \overline{A} B C + \overline{A} B C + A B C\)
(b) \(A B C D + \overline{A} B C D + \overline{A} B C D + A B C D\)
(c) \(A \overline{B} C D + \overline{A} B C D + \overline{A} B C D + \overline{A} B C D\)

Q.4 Consider the function \(f(a, b, c, d)\) which determines if the bit pattern abcd represents a spring or summer month, that is March (month 3) to August (month 8) inclusive.
(a) Derive a truth table.
(b) Draw a Karnaugh map.
(c) Derive a simplified sum-of-products expression.
(d) Draw the circuit using AND and OR gates.