3. Karnaugh maps and Boolean algebra can be used to simplify logic functions.

$F_1 = A.B + \bar{A}.B.\bar{C}.D + \bar{A}.B.C.D + A.\bar{B}.\bar{C}.\bar{D}$

$F_2 = (A + \bar{B}).(\bar{A} + C).(B + \bar{C})$

(a) Reduce F_1 to its simplest sum of products form using a Karnaugh map. [9]

(b) Reduce F_2 to its simplest sum of products form using Boolean algebra. [9]

(c) Design a logic circuit that implements F_1 using only NAND gates. [7]