| Q1 | 10 pts | | Q3 | 10 pts | | Q5 | 10 pts | |
| Q2 | 10 pts | | Q4 | 10 pts | | Total | | |

Note: No Calculator Allowed.
You must write your procedures that best describe your approach to answer the question.

1. [10 pts] Simplify the following Boolean functions using K-maps:
    (a)   [5 pts] F(A,B,C,D) = Σ (0,4,10,11,13,14,15) by ***sum-of-products***.
    (b)   [5 pts] F(A,B,C,D) = Σ (0,1,2,3,4,5,12,13,14) by ***sum-of-products.***

    a) F = AC + A'C'D' + ABD

    b) F = ABD' + BC' + A'B'

2. [10 pts] Use K-maps to simplify the Boolean function
    a)   [5 pts] $F(A,B,C,D) = \Pi\,(2,3,7,8,10,12,14)$ by **sum-of-products.**
    b) [5 pts] $F(A,B,C,D) = \Sigma\,(3,9,13,15)$, $d(A,B,C,D) = \Sigma\,(7,10,11,14)$ by **sum-of-products.**

    a)   F = A'C' + AD + A'BD'

    b)   F = AD + CD

3. [10 pts] Simplify the following Boolean functions using K-maps:
   a) [5 pts] $F(A,B,C,D) = \Sigma (1,8,5,7,12)$, $d(A,B,C,D) = (0,4)$ by ***sum-of-products.***
   b) [5 pts] $F(A,B,C,D) = \Sigma (0,6,8,10,12,14,15)$, $d(A,B,C,D) = \Sigma (2,9)$ by ***product-of-sums.***

   a) $F = C'D' + A'C' + A'BD$

   b) $F = (A + D')(B + D')(A + B' + C)(C + D')$

4. [10 pts] Simplify the following Boolean functions using K-maps:
    a) [5 pts] F(A,B,C,D) = B'C' + AD' + BC'D' + A'B'CD by ***sum-of-products.***
    b) [5 pts] F(A,B,C,D) = (A' + B + C) (A + B' + D)(B' + C + D) by ***sum-of-products.***

    a) F = B'C' + AD' + C'D' + A'B'D

    b) F = BD + AC + A'B'

5. Simplify the following Boolean functions using K-maps:
   a) [5 pts] $F(A,B,C,D) = \Sigma\ (3,4,6,11,14),\ d(A,B,C,D) = \Sigma\ (7,15)$ by **sum-of-products**.
   b) [5 pts] $F(A,B,C,D) = \Sigma\ (1,3,5,7,9,15),\ d(A,B,C,D) = \Sigma\ (4,6,12,13)$ by **sum-of-products**.

   a) F = BC + CD + A'BD'

   b) F = A'D + BD + C'D