# Quiz 3 Solution, COE 233, Term 232
## Dr. Muhammad Elrabaa

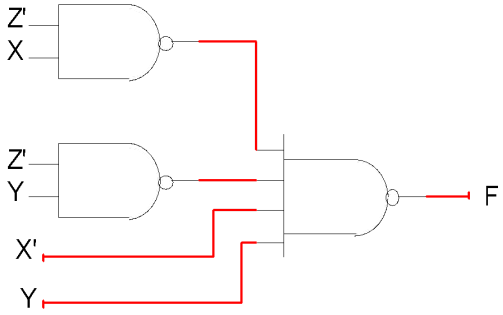
**Q1) Let F = X+Y' + Z' (X + Y)**

**a.** Find the expression of the complement of **F**, i.e. **F'** as is (i.e. **do not re-arrange F first**) **[2 points]**

**F' = (X'+Y+ [Z' (X + Y)]' = X'Y(Z+X'Y')**

**b.** Show the two-level **NAND** implementation of **F** without any simplification (assume inputs X, Y, and Z are available as true and complement) **[3 points]**

**1st convert F to SOP: F = X+Y' + Z'X + Z'Y**




**c. Represent F using the POM Canonical** form (the short mathematical representation, not the algebraic one) **[2 points]**

**1st represent F as SOM: X = (m4,m5,m6,m7), Y' = (m0, m1, m4,m5) , Z'X = (m4, m6), Z'Y= (m2, m6)**

- **F(X,Y,Z) = ∑m (0,1,2,4,5,6,7) F(X,Y,Z) = ∏ M(3)**

**d. Simplify F** to minimum number of literals **[1 point]**

**F = X+Y' + Z'X + Z'Y = X(1+Z') +Y'+Z'Y = X + (Y'+Z)(Y'+Y) = X + Y' + Z' (M3!)**

**Q2)** Let **G(A,B,C) = ∑m(0,2,4,5,6,7)** Simplify G to minimum number of literals in **POS** form **[2 points]**

**1st represent G as POM: G(A,B,C) = ∏ M(1,3), then obtain the algebraic expression of G:**

**G = (A+B+C')(A+B'+C') – using distribution and taking A+C' as common factor:**

**G = (A+C')+BB' = A+C'+0 = A+C'**