

Q-1: Taking **W, Y** and **Z** as the selector pins **construct** the following logic function using **8x1 MUX**.
$$F(W, X, Y, Z) = \sum(0, 2, 3, 5, 7, 10, 11, 15)$$

Q-2: In an office building of **XYZ** software company, there are 4 floors including the ground floor. The office of the CEO is on the 1st (floor). The Head of Software division sits on the 3rd floor (top floor). The regular employees sit on the 2nd floor. You are hired to install and program a lift in such a way that whenever call is generated in all the floors, for the lift, the floor with the office of CEO is given highest priority, followed by the floor with the office of Head of software division and then to the floor with the office of employees. If no one is calling for the lift from the above floors, the lift picks up people from the ground floor. **Build** the system showing your truth table and logic gate diagram.

Q-3: Prepare the **logic diagram** of $F = (A, B, C, D) = \bar{A}B + BCD + ACD + AC\bar{C}$ using **decoder**.

Q-4: Consider the following expression $F(A, B, C, D) = \sum(2, 3, 4, 7, 10, 11, 12, 14)$
(i) Simplified SOP expression (ii) Simplified POS expression

Q-5: Prepare a system for an automatic door opener in a grocery store which is operated by three input sensors A, B, and C. Sensor A is ON when it detects the presence of any person near the door, B is ON when the force open switch is pressed, and C is ON when the force close switch is pressed. The door will be open when force open switch is ON while force close switch remains OFF, or when sensor A detects any person near the door while the other two sensors remain OFF. If both force open and close switches are pressed simultaneously, an alarm sound. Let's consider output Y is HIGH if the door is open and output Z is HIGH when the alarm makes the sound. Prepare a truth table for the system, construct the minimum output SOP expressions and show the logic system with basic logic gates.

Q-6: Consider the following expression, $F(A, B, C, D) = \sum(0, 2, 3, 4, 6, 10)$ and $d(A, B, C, D) = (5, 12, 14, 15)$ Where, $d(A, B, C, D)$ represents the don't care conditions.

(a) Without using the don't care conditions, prepare:

(i) Simplified SOP expression (ii) Simplified POS expression

(b) Using the don't care conditions, prepare:

(i) Simplified SOP expression (ii) Simplified POS expression

(c) For the most simplified expression obtained in Question 2(b), draw a logic diagram

(i) Using universal NOR gate only. (ii) Using universal NAND gate only.