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Q.36 If $X = 1$ in the logic equation

$$\left[X + Z\left\{\overline{Y} + \left(\overline{Z} + X\overline{Y}\right)\right\}\right]\left\{\overline{X} + \overline{Z}(X+Y)\right\} = 1,$$

then

(A) $Y = Z$ (B) $Y = \overline{Z}$ (C) $Z = 1$ (D) $Z = 0$

Solution:

Given:

$$[X + Z\{Y + (Z + XY)\}]\left\{\overline{X} + \overline{Z}(X+Y)\right\} = 1$$

Substitute $X = 1$:

$$[1 + Z\{Y + (Z + 1 \cdot Y)\}]\left\{\overline{1} + \overline{Z}(1+Y)\right\} = 1$$
$$[1 + Z\{Y + Z + Y\}]\left\{0 + \overline{Z}(1+Y)\right\} = 1$$
$$[1 + Z(2Y + Z)]\left[\overline{Z}(1+Y)\right] = 1$$

For the product to be 1, both factors must be non-zero.
The second factor is $\overline{Z}(1+Y)$. For this to be non-zero:

$$\overline{Z} = 1 \Rightarrow Z = 0$$

Now substitute $Z = 0$ into the full expression:

$$[1 + 0 \cdot (2Y + 0)]\,(1 \cdot (1+Y)) = 1$$
$$[1](1+Y) = 1$$

Since $(1+Y) \geq 1$, the expression equals 1 regardless of Y's value.
Therefore, the correct answer is (D) $Z = 0$.