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Section:

BSCS-2D

Question # 1:

As,

$$\overline{\overline{A}} = A$$

So,

$$X = \overline{\overline{A} \cdot [B + C \cdot (D + E)]}$$

$$= \overline{\overline{A}} \div \overline{[B + C \cdot (D + E)]}$$

$$= A + \overline{[B + C \cdot (D + E)]}$$

As, $[B + C \cdot (D + E)]$ already has a NOR Gate.

So,

$$C \cdot (D + E) = \overline{\overline{C \cdot (D + E)}}$$

$$= \overline{\overline{C}} + \overline{(D + E)}$$

$$X = A + [B + [C + (\overline{D+E})]]$$

Question #2:

(i) $X = \bar{A} \cdot B + A \cdot C + \bar{A}$

As, $\bar{\bar{A}} = A$

So,

$$X = \bar{A} \cdot B + A \cdot C + \bar{A}$$

$$X = (\bar{A} \cdot B) + (A \cdot C) + \bar{A}$$

$$X = (\bar{A} \cdot B) \cdot (A \cdot C) \cdot A$$

(ii) $X = \bar{A} \cdot B + \bar{A} \cdot C \cdot D + B \cdot D \cdot \bar{D}$

As,

$B \cdot D \cdot \bar{D} = 0$, So no need to write that

$$X = \bar{A} \cdot B + \bar{A} \cdot C \cdot D$$

This is already passing through NOR at the end, so we will see individual expressions:

$$\bar{A} \cdot B = \overline{(\bar{A} \cdot B)}$$

$$= (\overline{A + B})$$

$$= (A + \overline{B})$$

$$\overline{A} \cdot C \cdot D = \overline{(\overline{A} \cdot C \cdot D)}$$

$$= (\overline{\overline{A} \cdot C \cdot D})$$

$$= (A + \overline{C} + \overline{D})$$

So we have,

$$X = \overline{(A + \overline{B}) + (A + \overline{C} + \overline{D})}$$

Question # 4:

$$(i) \quad \begin{aligned} J_1 &= 1010011 \\ J_2 &= 0111010 \\ J_3 &= 1111000 \end{aligned}$$

$$J = J_1 \cdot J_2 \cdot J_3$$

$$J = 0010000$$

$$K_1 = 0001110$$

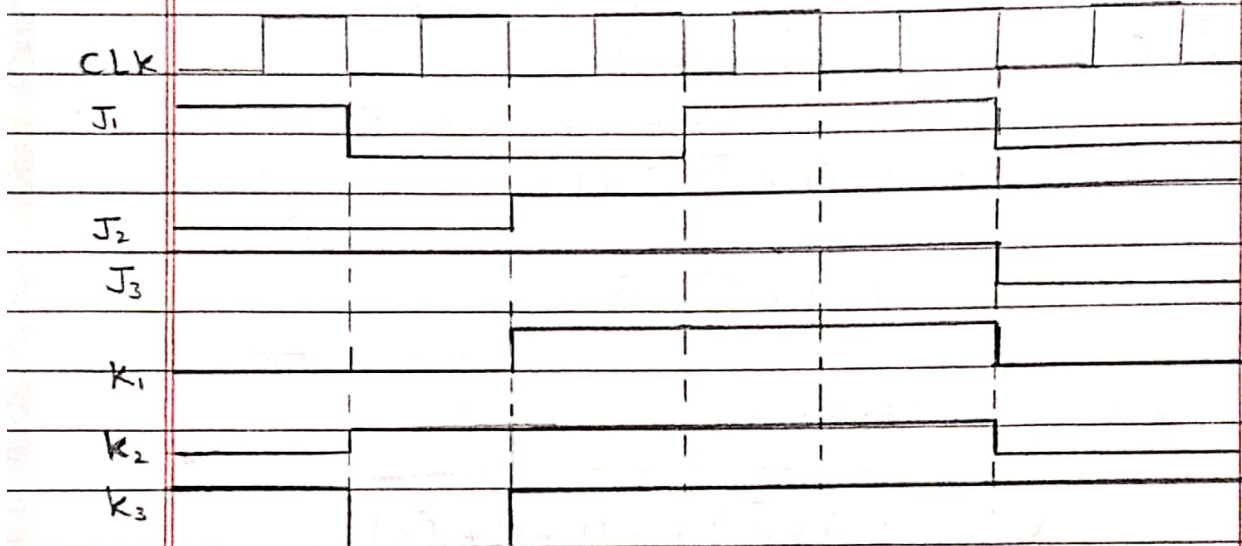
$$K_2 = 1101100$$

$$K_3 = 1010101$$

$$K = 0000100$$

$Q = 0011000$

(ii.)



Q Rest Toggle Reset.

Question #3:

The JK Flip Flop is basically a gated RS flip flop with the addition of the clock input circuitry. When both the input S and R are equal to logic "1", the invalid condition takes place.

Thus, to prevent this invalid condition, a clock circuit is introduced. The

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Jk Flip Flop has four possible input combination because of the addition of the clocked input. The four inputs are "logic 1", "logic 0", "No change" and "Toggle".