

[illegible]

2. Write the Boolean expression for each of the outputs of the next state decoder

- $J_A = \overline{B}C + \overline{B}\overline{X}$
- $K_A = B$
- $J_B = A\overline{B} + \overline{B}C$
- $K_B = B$
- $J_C = \overline{A}X$
- $K_C = B + \overline{X}$

The diagram illustrates a 3-bit counter implemented with three J-K flip-flops and combinational logic. The inputs are labeled X, A, B, and C, and the outputs are labeled Q, Q̄, and Q̄. The logic is as follows:

- Flip-Flop 1 (Top):** J = A, K = B, C = C. The output Q is labeled A, and the output Q̄ is labeled B.
- Flip-Flop 2 (Middle):** J = A, K = B, C = C. The output Q is labeled B, and the output Q̄ is labeled C.
- Flip-Flop 3 (Bottom):** J = A, K = B, C = C. The output Q is labeled C, and the output Q̄ is labeled A.

The combinational logic consists of several AND gates and OR gates that combine the inputs A, B, and C to produce the J, K, and C inputs for the flip-flops. Specifically, the J input of each flip-flop is connected to A, and the K input is connected to B. The C input of each flip-flop is connected to C. The output of the top flip-flop (A) is connected to the J input of the middle flip-flop, and the output of the middle flip-flop (B) is connected to the J input of the bottom flip-flop. The output of the bottom flip-flop (C) is connected to the J input of the top flip-flop. The output of the top flip-flop (A) is also connected to the C input of the middle flip-flop, and the output of the middle flip-flop (B) is connected to the C input of the bottom flip-flop. The output of the bottom flip-flop (C) is also connected to the C input of the top flip-flop.

Figure 2. Array of Flip-Flops

x



Figure 3. Output Decoder

Write Boolean equations for the output decoder.

- $L = \overline{ABCX}$
- $\overline{L} = ABCX$