

1 JK flip-flop to T flip-flop

ID: c233191

Step 1: JK is available T is required flip-flop

Step 2

Characteristic Table.

| T (Input) | $Q(t)$ (Present state) | $Q(t+1)$ (Next) | J | K |
|----------------|---------------------------|--------------------|-----|-----|
| 0 | 0 | 0 | 0 | X |
| 0 | 1 | 1 | X | 0 |
| 1 | 0 | 1 | 1 | X |
| 1 | 1 | 0 | X | 1 |

Excitation Table of JK

| Q_t | Q_{t+1} | J | K |
|-------|-----------|-----|-----|
| 0 | 0 | 0 | X |
| 0 | 1 | 1 | X |
| 1 | 0 | X | 1 |
| 1 | 1 | X | 0 |

Step 3

For J the Kmap

| $T \backslash Q_t$ | \bar{Q}_t | Q_t |
|--------------------|-------------|-------|
| \bar{T} | | X |
| T | 1 | X |

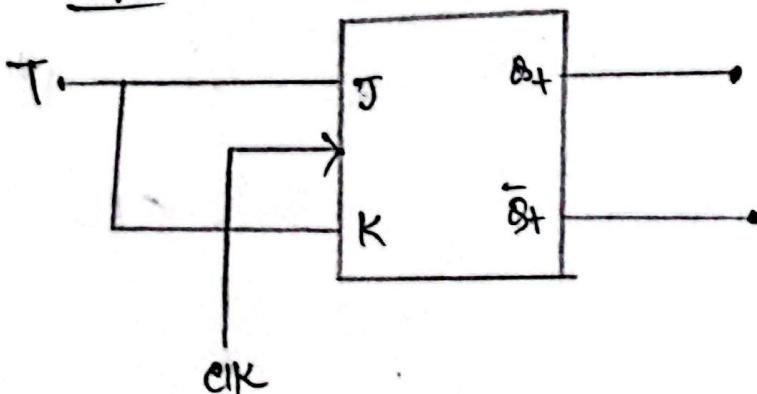
$$J = T$$

for K the Kmap

| $T \backslash Q_t$ | \bar{Q}_t | Q_t |
|--------------------|-------------|-------|
| \bar{T} | X | |
| T | X | 1 |

$$K = T$$

Step 4



[2] JK flip-flop to D flip-flop

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Step 1 JK is available & is required.

Step 2:

Characteristic Table.

| D | Q_t | Q_{t+1} | J | K |
|---|-------|-----------|---|---|
| 0 | 0 | 0 | 0 | X |
| 0 | 1 | 0 | X | 1 |
| 1 | 0 | 1 | 1 | X |
| 1 | 1 | 1 | X | 0 |

Excitation table for JK

| Q_t | Q_{t+1} | J | K |
|-------|-----------|---|---|
| 0 | 0 | 0 | X |
| 0 | 1 | 1 | X |
| 1 | 0 | X | 1 |
| 1 | 1 | X | 0 |

Step 3: Kmap for J

| Q_t | \bar{Q}_t | Q_t |
|-----------|-------------|-------|
| \bar{D} | | X |
| D | 1 | X |

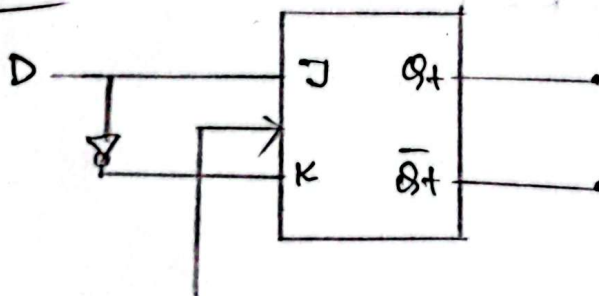
$$J = D$$

K map for K

| Q_t | \bar{Q}_t | Q_t |
|-----------|-------------|-------|
| \bar{D} | X | 1 |
| D | X | |

$$K = \bar{D}$$

Step 4



③ D to T flipflop conversion

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Step 1: D is available T is required flipflop.

Step 2:

Characteristic Table

| Q_t | T | Q_{t+1} | D |
|-------|---|-----------|---|
| 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 0 |

Excitation Table of D

| Q_t | D | Q_{t+1} |
|-------|---|-----------|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

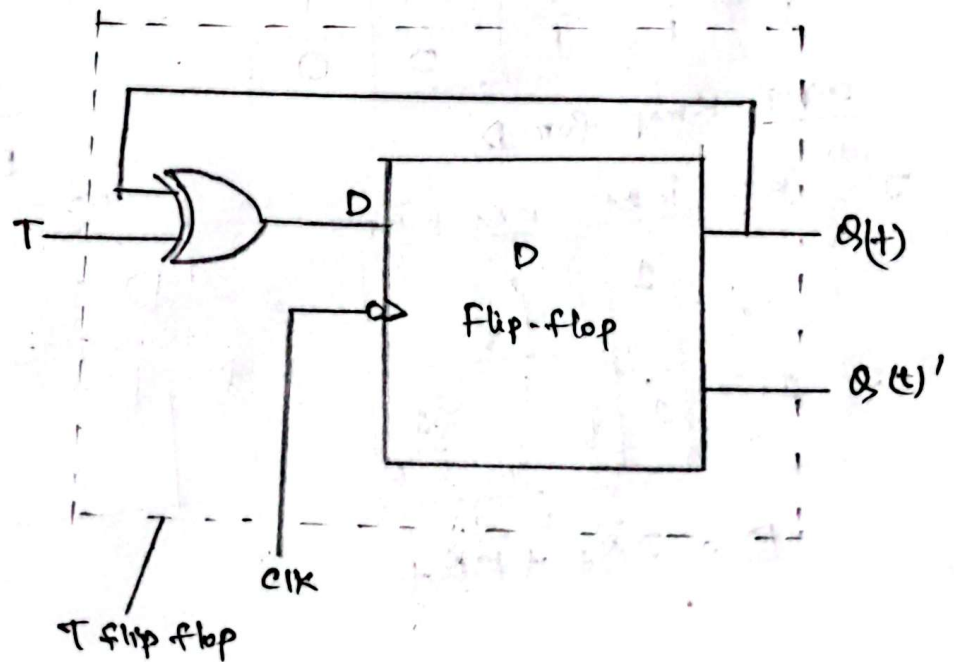
Step 3: K-map for D.

| Q | T | \bar{T} | |
|-----------|---|-----------|--|
| \bar{Q} | | | |
| Q | | | |

\bar{Q} T: 0, 1
 Q \bar{T} : 1, 0
 Bottom row: 2, 3

$$D = T\bar{Q} + \bar{T}Q$$

Step 4:



4] D flipflop to JK flip flop

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step 1: D is available and JK is required flipflop.

step 2:

Characteristic Table.

| J | K | Q_t | Q_{t+1} | D |
|---|---|-------|-----------|---|
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 1 | 0 | 0 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 0 |

Excitation Table for D

| Q_t | Q_{t+1} | D |
|-------|-----------|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

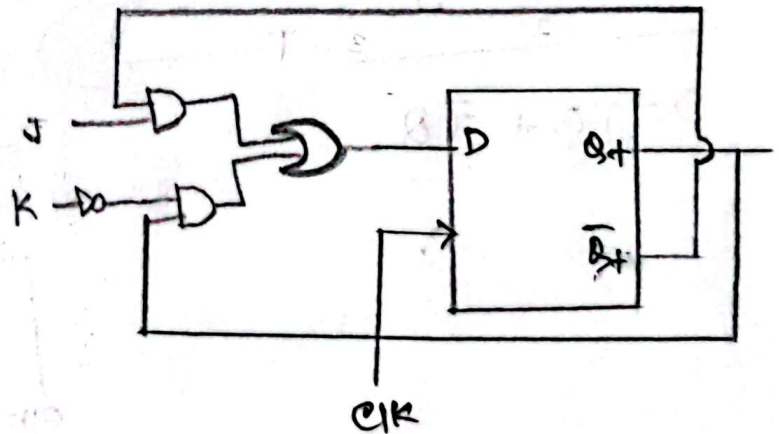
step 3: Kmap for D

| Q_t | $\bar{K}Q_t$ | $\bar{K}\bar{Q}_t$ | KQ_t | $K\bar{Q}_t$ |
|-----------|--------------|--------------------|--------|--------------|
| \bar{J} | | 1 | | |
| J | 1 | 1 | | 1 |

$$D = J\bar{Q}_t + \bar{K}Q_t$$

step 4

$$D = J\bar{Q}_t + \bar{K}Q_t$$



5) T flip flop to JK flip flop

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Step 1: T is available and JK is required flipflop.

Step 2:

Characteristic Table

| J | K | Q_t | Q_{t+1} | T |
|---|---|-------|-----------|---|
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 1 | 0 | 1 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 1 |

Excitation Table of T

| Q_t | Q_{t+1} | T |
|-------|-----------|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

Step 4

$$T = J\bar{Q}_t + KQ_t$$

Step 3

K map of T

| J \ K | Q_t | \bar{Q}_t | Q_t | \bar{Q}_t |
|-------|-------|-------------|-------|-------------|
| 0 | 0 | 1 | 3 | 2 |
| 1 | 4 | 5 | 7 | 6 |

$$D = J\bar{Q}_t + KQ_t$$

