# CS & IT ENGINEERING

## DIGITAL LOGIC

Sequential Circuit

DPP 02 Discussion Notes

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01 Questions

02 Discussion

**Q.1**

Consider the following J-K flip-flop

In the above J-K flip-flop, $J = \bar{Q}$ and K = 1. Assume that the flip-flop was initially cleared and then clocked for 6 pulses. What is the sequence at the Q output?

A. 010000

B. 011001

C. 010010

D. 010101


0 → 1 → 0 → 1 → 0 → 1 → 0

**Q.2** Consider the given circuit.
In this circuit, the race around


A. does not occur.

B. occurs when CLK = 0.

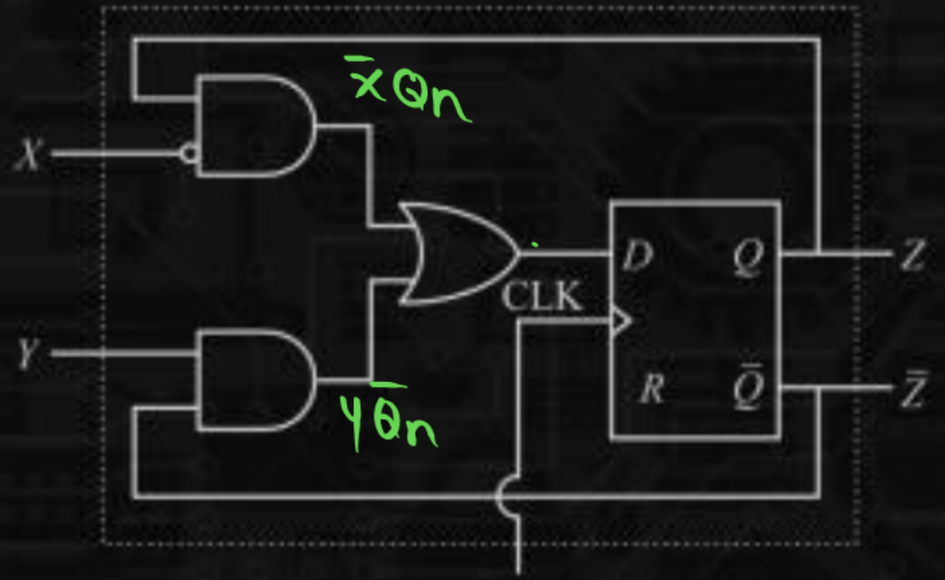
C. occurs when CLK = 1 and A = B = 1.

D. occurs when CLK = 1 and A = B = 0.

**Q.3** A sequential circuit using D Flip-Flop and logic gates is shown in figure, where X and Y are the inputs and Z is the output. The circuit is

$Q_{n+1} = S + \bar{R}Q_n$ X

$Q_{n+1} = J\bar{Q}_n + \bar{K}Q_n$




$D = \bar{x}Q_n + y\bar{Q}_n$

$Q_{n+1} = D$

$Q_{n+1} = \bar{x}Q_n + y\bar{Q}_n$

$Q_{n+1} = \bar{K}Q_n + J\bar{Q}_n$

$X = K$ $Y = J$

A. S-R Flip-Flop with inputs X = R and Y = S.

B. S-R Flip-Flop with inputs X = S and Y = R.

C. J-K Flip-Flop with inputs X = J and Y = K.

D. J-K Flip-Flop with inputs X = K and Y = J.

**Q.4**

The frequency of the clock signal applied to the negative going edge triggered JK flip flop shown below is 5 kHz. What is frequency of signal available at Q ?

A. 2.5 kHz

B. 5 kHz

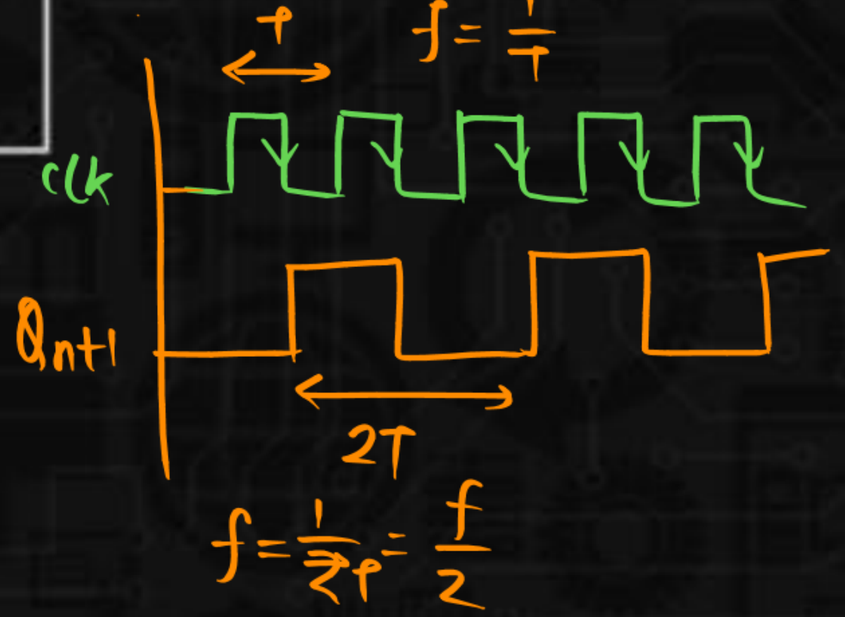
C. 10 kHz

D. 1.25 kHz


5 kHz · $f_{clk}$

$\frac{f_{clk}}{2} = \frac{5}{2} = 2.5\,kHz$

0 → 1 → 0 → 1 → 0 → 1




$f = \frac{1}{2T} = \frac{f}{2}$

## Q.5

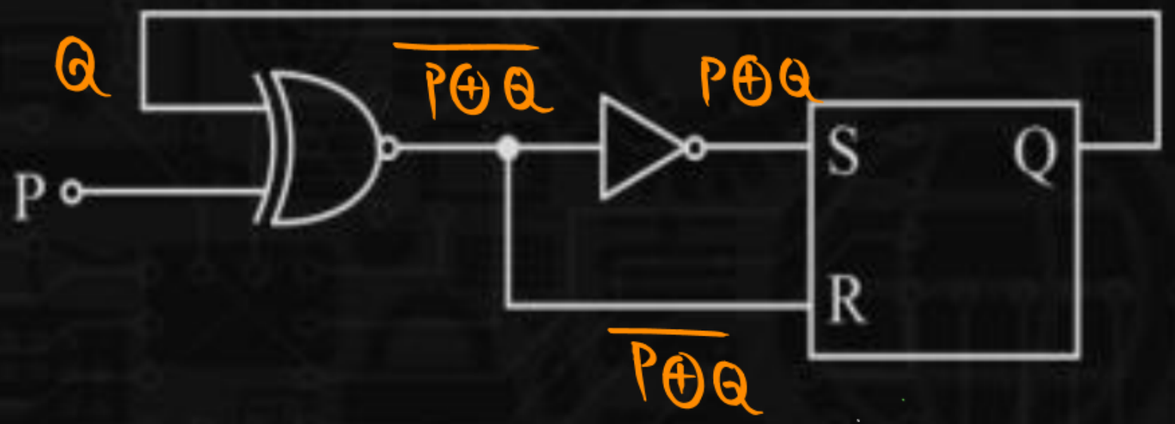
The RS flip flop is modified so as to realize a flip flop with single input P. The characteristic equation of a new flip-flop will be

A. $Q(t+1)=P\oplus Q$

B. $Q(t+1)=\overline{P\oplus Q}$

C. $Q(t+1)=P+Q$

D. $Q(t+1)=P$




$Q_{n+1}=S+\bar{R}Q_n$

$=(P\oplus Q_n)+(P\oplus Q_n)Q_n$

$=P\oplus Q_n[1+Q_n]=P\oplus Q_n$

$S=P\oplus Q_n$

$R=\overline{P\oplus Q_n}=P\odot Q_n=\bar{P}\bar{Q}_n+PQ_n$

$\bar{R}=P\oplus Q_n$

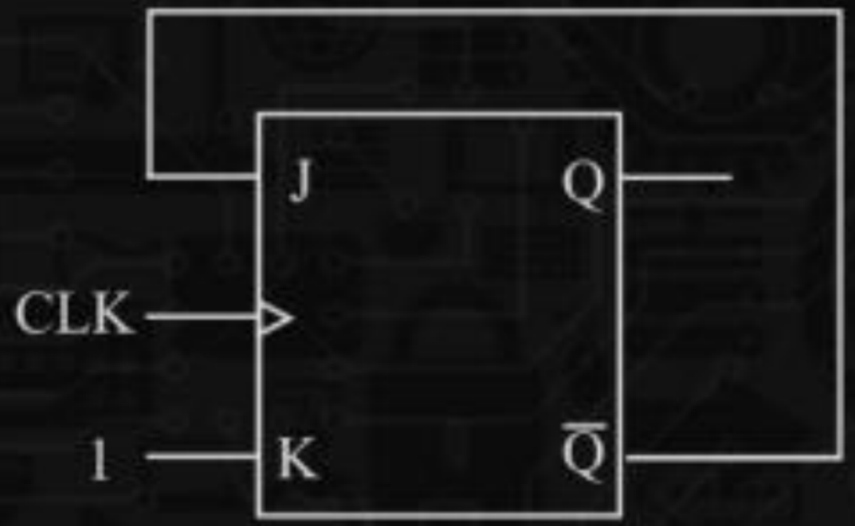
**Q.6** The J-K FF shown below is initially cleared and then clocked for 5 pulses, the sequence at the Q output will be

A. 0 1 0 0 0 0

B. 0 1 1 0 0 1

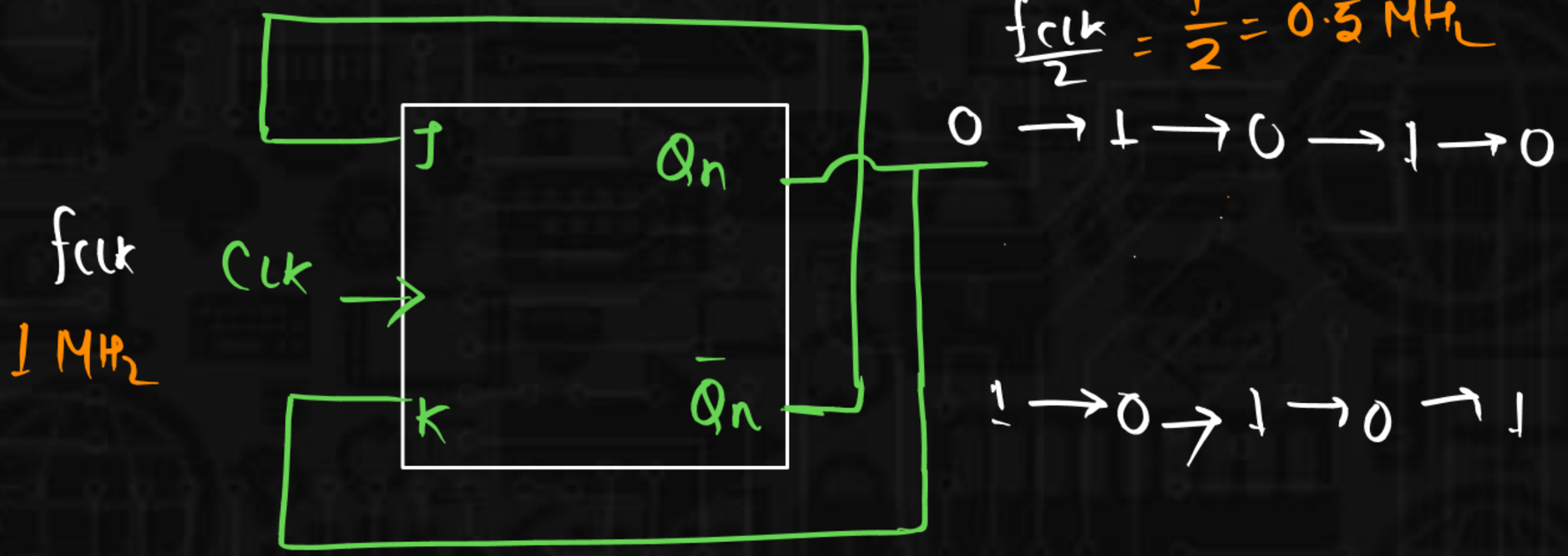
C. 0 1 0 0 1 0

D. 0 1 0 1 0 1




$0 \rightarrow 1 \rightarrow 0 \rightarrow 1 \rightarrow 0 \rightarrow 1$

**Q.7** For a J-K flip-flop, J input is tied to its own $\bar{Q}$ output and its K input is connected to its own Q output. If the flip-flop is fed with a clock of frequency 1 MHz, its Q output frequency (in MHz) will be 0.5




$\frac{f_{clk}}{2} = \frac{1}{2} = 0.5$ MHz

0 → 1 → 0 → 1 → 0

1 → 0 → 1 → 0 → 1


THANK YOU GW
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