MULTIMEDIA UNIVERSITY

PDS0101 Introduction to Digital Systems

Tutorial 9

## Theory based questions

1. What is the difference between an asynchronous and synchronous counter?

2. Draw the logic circuit diagrams of a 3-bit asynchronous and 3-bit synchronous counter

3. Draw the timing diagrams of the outputs from both counters in question (2)

4. How many states would a modulus-15 counter have? What is the minimum number of FFs required to create this counter?

5. What is an asynchronous decade counter? Describe the characteristics.

6. Draw the logic circuit diagram of a asynchronous decade counter and draw is corresponding timing diagram from its outputs for one (1) cycle.

Applied knowledge based questions

1. Show how an asynchronous counter with a modulus of 12 can be constructed using flip-flops

2. For the ripple counter shown below, show the complete timing diagram for the outputs at Q_0 and Q_1 for eight clock pulses
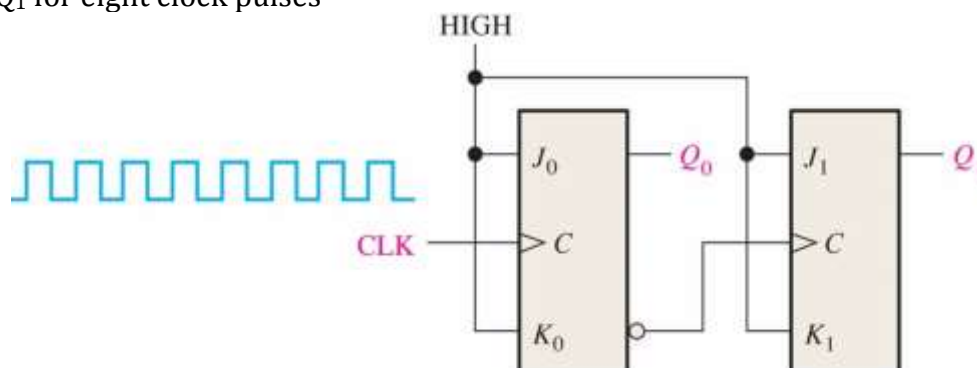
3. For the counter below, show the complete timing diagram for output waveforms at Q_0, Q_1 and Q_2 for sixteen clock cycles.

HIGH
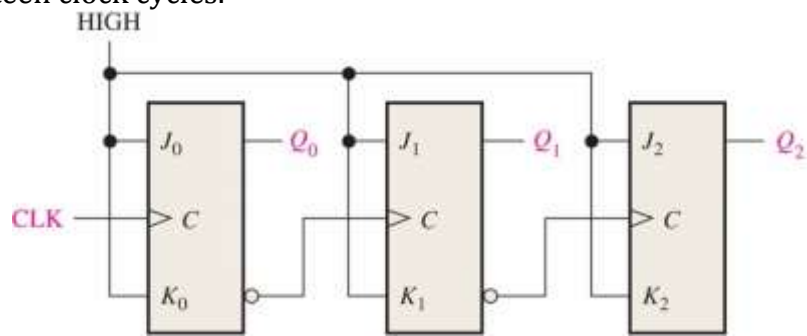
4. Design a counter to produce the following cyclic sequence
00,10,01,11

5. Alter the counter from (4) so that it only implements the stages 11, 01 and 10 in cycle

6. Design a binary counter with the sequence shown in the state diagram below
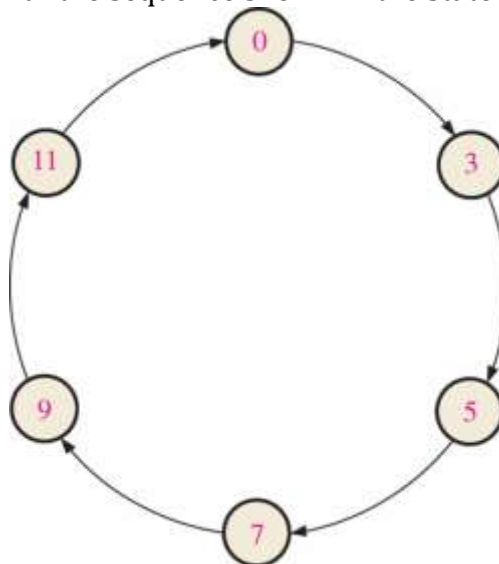
7. Design a counter using J-K FFs that follow the cyclic sequence 4,5,7,1,3. Find the minimum number of FFs required to implement the counter and any unwanted FF sequences in the counter go to 4