EC 2.101 - Digital Systems and Microcontrollers

Practice Sheet 4 (Lec 1 – Lec 24)

Q1. Design a 4-bit Ring Counter and Johnson Counter

Note: Ring Counter is similar to shift counter but output of last counter is connected to input of first. Johnson Counter is a type of synchronous ring counter where the complemented output is connected to the input.

Q2. Calculate the number of address lines and data lines required for the following memory units:

a) $8\text{K} \times 16$
b) $2\text{G} \times 8$
c) $32\text{M} \times 32$

Q3. RAM design

a) How many 32K * 8 RAM chips are needed to provide a memory capacity of 256K bytes?
b) How many lines of the address must be used to access 256K bytes? How many of these lines are connected to the address inputs of all chips?
c) How many lines must be decoded for the chip select inputs? Specify the size of the decoder.

Q4. A RAM has word size of 64 bits and capacity of 262144 words. If cycle time is 80 ns, how much time will it take to fill 6K bytes of the RAM with 0's.

Q5. A 16Mb memory array is designed with equal number of rows and columns. Find the minimum number of address lines to design a row decoder.