Queen Mary
University of London
Science and Engineering

# EBU4202: Digital Circuit Design Tutorials (Block 4)

Dr. Md Hasanuzzaman Sagor (Hasan)
Dr. Chao Shu (Chao)
Dr. Farha Lakhani (Farha)

School of Electronic Engineering and Computer Science,
Queen Mary University of London,
London, United Kingdom.

# Question 1&2

1. Explain what is meant by each of the following terms:

- Non-volatile
- Random Access
- DRAM
- EPROM

2. Using a suitable diagram, briefly explain the function of a DECODER.

# Question 3

- Suppose we have a computer with 256 MBytes of memory, with each memory chip having a capacity of 4 MBytes.

  i) How many memory chips are required?

  ii) How many address bits are required?

  iii) How many bits are required to select the memory chips?

  iv) Draw a block diagram of a circuit using a decoder so that all 256 Mbytes of memory can be addressed.

# Question 4

Design a 16 x 1-bit read-only memory (ROM) circuit pre-programmed with the data shown in the following table.

| Address | Data |
|---|---|
| 0 | 0 |
| 1 | 1 |
| 2 | 0 |
| 3 | 0 |
| 4 | 1 |
| 5 | 1 |
| 6 | 1 |
| 7 | 1 |
| 8 | 1 |
| 9 | 0 |
| 10 | 0 |
| 11 | 1 |
| 12 | 0 |
| 13 | 0 |
| 14 | 1 |
| 15 | 1 |

# Question 5

Design an 8 x 4-bit read-only memory (ROM) circuit pre-programmed with the data shown in the Table below. (Hint: diodes, decoder, multiplexer etc. are required in this ROM design).

| Address | Data (4 bit) |
|---|---|
| 0 | 4 |
| 1 | 9 |
| 2 | 10 |
| 3 | 12 |
| 4 | 15 |
| 5 | 1 |
| 6 | 3 |
| 7 | 0 |

# Question 6

Draw the Block Diagram of a Microcomputer showing CPU, memory and the three busses.

# Question 7

Design an 8 x 4-bit read-only memory (ROM) circuit pre-programmed with the data shown in the Table below. (Hint: diodes, decoder, multiplexer etc. are required in the ROM circuit).

| Address | Data (4 bit) |
|---|---|
| 0 | 8 |
| 1 | 15 |
| 2 | 8 |
| 3 | 0 |
| 4 | 14 |
| 5 | 14 |
| 6 | 1 |
| 7 | 1 |