Logic Design using Functional Blocks

Assignments

- 1. Design a combinational circuit with 4 inputs and 7 outputs, which receives BCD code words as input, and generates the corresponding Hamming code (for 4 message bits) as the output. Show the implementation diagram using:
 - a. NAND gates only
 - b. Multiplexers of suitable sizes
 - c. Only 2-to-1 multiplexers
- 2. Design a 16-to-1 multiplexer using 2-to-1 multiplexers as basic building block, and hence show how the following function can be implemented:

 $F(v,w,x,y,z) = \Sigma (0,4,5,8,12,14,15,18,25,32)$

- 3. Design a 5-to-32 decoder using 4-to-16 decoders, and hence implement the function F as specified in Q2.
- 4. Draw the truth table of a hexadecimal to 7-segment decoder, that takes a 4-bit hexadecimal digit as input, and display the corresponding character on the 7-segment display. Show a gate-level realization of the same.
- 5. Design a 4-bit Gray code to decimal decoder using two-dimensional gate switching matrix.
- 6. Show the gate-level design of a 2-bit digital comparator, and use it to implement an 8-bit comparator.
- 7. Implement a half adder and a full adder using multiplexers.
- 8. Design a multiplier that takes two 2-bit numbers as input, and produces a 4-bit product as the output.