# Questions

## NUMBER SYSTEM

**Q1:** Assuming that following binary numbers are written in 10-bit 2's complement binary notation (6-bits for integer part, 4-bits for decimal part), **calculate** their decimal equivalents:

a) 111101.0111

b) 011110.0111

**Q2: Write** the following decimal numbers in 2's complement binary notation (Use 8-bits for integer part and 4-bits for decimal part):

a) -66.0625

b) 122.375

**Q3: Calculate** Octal equivalents of following Hexadecimal numbers

a) DEAD.123A

b) BEEF.ABCD

**Q4: Perform** the following conversion (Up to 4 digits after decimal point)

a) $(56.36)_8 \rightarrow (\ ?\ )_6$

b) $(331.133)_4 \rightarrow (\ ?\ )_{13}$

## LOGIC GATES

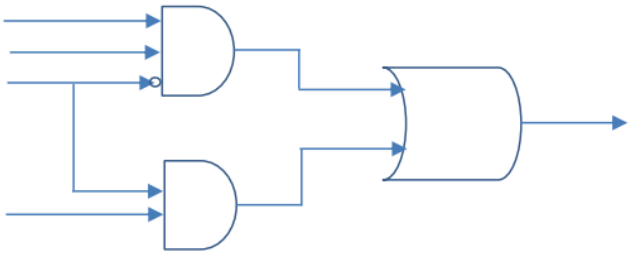
**Q1:** Make truth table of following expressions:

a) **(a' + c') + ( b . a + c' .d)**
b) **b' + a'.c.d'**

**Q2:** Given the Boolean function F = x y'z' + x'z + xyz

**a.** List the truth table
**b.** Draw the logic diagram of the original function using 2-input gates
**c.** Simplify the function using Boolean algebra
**d.** List the truth table of the simplified function

**Q3:** Analyze following circuit to give truth table.



**Q4:**

Find the **minimal sum of products** and **minimal products of sum** expressions for following KMAP. Show your groupings on KMAP.

| AB \ CD | | | |
|---|---|---|---|
| 1 | 0 | 0 | 1 |
| 0 | X | 1 | X |
| 0 | 1 | 1 | 0 |
| X | 0 | 0 | 1 |

## COMBINATIONAL CIRCUITS

**Q1:** Design a circuit for a A == B, where A and B are two 6-bit numbers.

**Q2:** Use 2-1 Multiplexers (and some logic gates if required) to design an 8-1 Multiplexer.

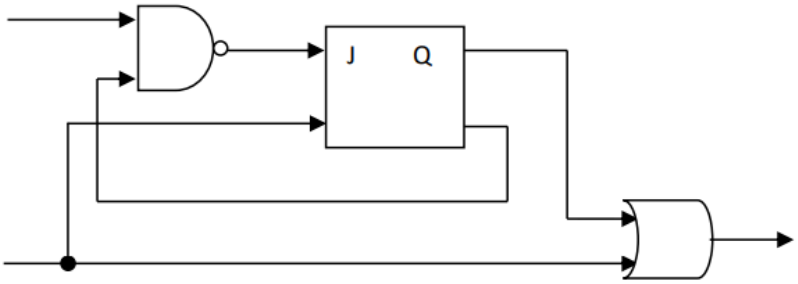
**Q3:** Design a 7-input priority encoder.

**Q4:** Design circuit diagram of a 3x3 Multiplier.

**Q5:** Design circuit diagram of a 7-bit adder. Underlying Adder must be carry select adder.

## SEQUENTIAL CIRCUITS

**Analyze** the following circuit to give state table:




**Develop** state diagram of a binary sequence recognizer that takes one-bit input at every cycle and outputs 1 if binary sequence is 00101.

**Construct** logic circuit for following state diagram.