CSE-2016 → Paper II

5) (d) Convert the following decimal numbers to equivalent binary and hexadecimal numbers:
(i) 4096 (ii) 0.4375 (iii) 2048.0625

⇒ (i) $(4096)_{10} = (1000)_{16} = (1000000000000)_2$

16 | 4096
16 | 256 — 0
16 | 16 — 0
1 — 0

decimal to hexadecimal

2 | 4096
2 | 2048 — 0
2 | 1024 — 0
2 | 512 — 0
2 | 256 — 0
2 | 128 — 0
2 | 64 — 0
2 | 32 — 0
2 | 16 — 0
2 | 8 — 0
2 | 4 — 0
2 | 2 — 0
1 — 0

decimal to binary

(ii) $(0.4375)_{10} = (0.7)_{16} = (0.0111)_2$

0.4375 × 16 = 7.0000 → 7

decimal to hexadecimal

0.4375 × 2 = 0.8750 → 0
0.875 × 2 = 1.75 → 1
0.75 × 2 = 1.5 → 1
0.5 × 2 = 1.0 → 1

decimal to binary

(iii) $(2048.0625)_{10} = (800.1)_{16} = (100000000000.0001)_2$

16 | 2048
16 | 128 — 0
8 — 0

0.0625 × 16 = 1 → 1

decimal to hexadecimal

2 | 2048
2 | 1024 — 0
2 | 512 — 0
2 | 256 — 0
2 | 128 — 0
2 | 64 — 0
2 | 32 — 0
2 | 16 — 0
2 | 8 — 0
2 | 4 — 0
2 | 2 — 0
1 — 0

decimal to binary

0.0625 × 2 = 0.125 → 0
0.125 × 2 = 0.25 → 0
0.25 × 2 = 0.5 → 0
0.5 × 2 = 1.0 → 1

8. (c) Let A, B, C be Boolean variables, $\bar{A}$ denote complement of A, A+B is an expression for A OR B and A.B is an expression for A AND B. Then simplify the following expression and draw a block diagram of the simplified expression, using AND and OR gates,

$A.(A+B+C).(\bar{A}+B+C).(A+\bar{B}+C).(A+B+\bar{C})$

⇒ We have,

$A.(A+B+C).(\bar{A}+B+C).(A+\bar{B}+C).(A+B+\bar{C})$

$= A.(A.\bar{A}+B+C).(A+\bar{B}+C).(A+B+\bar{C})$

$= A.(B+C).(A+\bar{B}+C).(A+B+\bar{C})$ $[\because A.\bar{A}=0]$

$= A.(B+C).\{A+(\bar{B}+C).(B+\bar{C})\}$

$= A.(B+C).(A+\bar{B}.B+\bar{B}.\bar{C}+CB+C.\bar{C})$

$= A.(B+C).(A+\bar{B}\bar{C}+CB)$

$= A.(B+C).(A+1)$ $[\because A+\bar{A}=1]$

$= A.(B+C).1$ $[\because A+1=1]$

$= A.(B+C)$ $[\because a.1=a]$