Solution_Tutorial_1

Solution1:

(a) $64_{10} = 1000000_2$ (c) $111_{10} = 1101111_2$ (e) $255_{10} = 11111111_2$
(b) $100_{10} = 1100100_2$ (d) $145_{10} = 10010001_2$ (f) $500_{10} = 111110100_2$

Solution2:

$34.75_{10} = 100010.11_2$.

$25.25_{10} = 11001.01_2$.

$27.1875_{10} = 11011.0011_2$.

Solution3:

5. *Convert each of the following binary numbers to octal, decimal, and hexadecimal formats.*

$(111011101)_2$
to octal: 111 011 101 = $(735)_8$
to decimal: $=(1x2^8) + (1x2^7) + (1x2^6) + (1x2^4) + (1x2^3) + (1x2^2) + (1x2^0)$
$= 256 + 128 + 64 + 16 + 8 + 4 + 1$
$= (477)_{10}$
to hexadecimal: 0001 1101 1101 = $(1DD)_{16}$

$(10101010111)_2$
to octal: 010 101 010 111 = $(2527)_8$
to decimal: $=(1x2^{10}) + (1x2^8) + (1x2^6) + (1x2^4) + (1x2^2) + (1x2^1) + (1x2^0)$
$= 1024 + 256 + 64 + 16 + 4 + 2 + 1$
$= (1367)_{10}$
to hexadecimal: = 0101 0101 0111 $(557)_{16}$

$(111100000)_2$
to octal: = 111 100 000 $(740)_8$
to decimal: $=(1x2^8) + (1x2^7) + (1x2^6) + (1x2^5)$
$= 256 + 128 + 64 + 32$
$= (480)_{10}$
to hexadecimal: = 0001 1110 0000 $(1E0)_{16}$

Solution4:

6. *Convert each of the following octal numbers to binary, decimal, and hexadecimal formats.*

$(3754)_8$

to binary: $= (11\ 111\ 101\ 100)_2$

to decimal: $=(3x8^3) + (7x8^2) + (5x8^1) + (4x8^0)$

$= 1536 + 448 + 40 + 4$

$= (2028)_{10}$

to hexadecimal: $= (0111\ 1110\ 1100)_2 = (7EC)_{16}$

$(7777)_8$

to binary: $= (111\ 111\ 111\ 111)_2$

to decimal: $=(7x8^3) + (7x8^2) + (7x8^1) + (7x8^0)$

$= 3584 + 448 + 56 + 7$

$= (4095)_{10}$

to hexadecimal: $= (1111\ 1111\ 1111)_2 = (FFF)_{16}$

$(247)_8$

to binary: $= (10\ 100\ 111)_2$

to decimal: $=(2x8^2) + (4x8^1) + (7x8^0)$

$= 128 + 32 + 7$

$= (167)_{10}$

to hexadecimal: $= (1010\ 0111)_2 = (A7)_{16}$

Solution5:

7. *Convert each of the following decimal numbers to binary, octal, an hexadecimal formats.*

$(3479)_{10}$

to binary: = 3479 ÷ 2 = 1739 rem = 1
1739 ÷ 2 = 869 rem = 1
869 ÷ 2 = 434 rem = 1
434 ÷ 2 = 217 rem = 0
217 ÷ 2 = 108 rem = 1
108 ÷ 2 = 54 rem = 0
54 ÷ 2 = 27 rem = 0
27 ÷ 2 = 13 rem = 1
13 ÷ 2 = 6 rem = 1
6 ÷ 2 = 3 rem = 0
3 ÷ 2 = 1 rem = 1
1 ÷ 2 = 0 rem = 1
reading bottom to top of remainders = $(110110010111)_2$

to octal: = 3479 ÷ 8 = 434 rem = 7
434 ÷ 8 = 54 rem = 2
54 ÷ 8 = 6 rem = 6
6 ÷ 8 = 0 rem = 6
reading bottom to top of remainders = $(6627)_8$

to hexadecimal: = 3479 ÷ 16 = 217 rem = 7
217 ÷ 16 = 13 rem = 9
13 ÷ 16 = 0 rem = 13 (D)
reading bottom to top of remainders = $(D97)_{16}$

$(642)_{10}$

to binary: = 642 ÷ 2 = 321 rem =0
321 ÷ 2 = 160 rem = 1
160 ÷ 2 = 80 rem = 0
80 ÷ 2 = 40 rem = 0
40 ÷ 2 = 20 rem = 0
20 ÷ 2 = 10 rem = 0
10 ÷ 2 = 5 rem = 0
5 ÷ 2 = 2 rem = 1
2 ÷ 2 = 1 rem = 0
1 ÷ 2 = 0 rem = 1
reading bottom to top of remainders = $(1010000010)_2$

to octal: = 642 ÷ 8 = 80 rem = 2
80 ÷ 8 = 10 rem = 0
10 ÷ 8 = 1 rem = 2
1 ÷ 8 = 0 rem = 1
reading bottom to top of remainders = $(1202)_8$

to hexadecimal: = 642 ÷ 16 = 40 rem = 2
40 ÷ 16 = 2 rem = 8
2 ÷ 16 = 0 rem = 2
reading bottom to top of remainders = $(282)_{16}$

$(555)_{10}$

to binary: = 555 ÷ 2 = 277 rem = 1
277 ÷ 2 = 138 rem = 1
138 ÷ 2 = 69 rem = 0
69 ÷ 2 = 34 rem = 1
34 ÷ 2 = 17 rem = 0
17 ÷ 2 = 8 rem = 1
8 ÷ 2 = 4 rem = 0
4 ÷ 2 = 2 rem = 0
2 ÷ 2 = 1 rem = 0

1 ÷ 2 = 0 rem = 1
reading bottom to top of remainders = $(1000101011)_2$

to octal: = 555 ÷ 8 = 69 rem = 3
69 ÷ 8 = 8 rem = 5
8 ÷ 8 = 1 rem = 0
1 ÷ 8 = 0 rem = 1
reading bottom to top of remainders = $(1053)_8$

to hexadecimal: = 555 ÷ 16 = 34 rem = 11 (B)
34 ÷ 16 = 2 rem = 2
2 ÷ 16 = 0 rem = 2
reading bottom to top of remainders = $(22B)_{16}$

Solution6:

8. *Convert each of the following hexadecimal numbers to binary, octal, an decimal formats.*

$(4FB2)_{16}$

to binary: $(100\ 1111\ 1011\ 0010)_2$

to octal: $(100\ 1111\ 1011\ 0010)_2 = (47662)_8$

to decimal: $= (4x16^3) + (15x16^2) + (11x16^1) + (2x16^0)$

$= (4x4096) + (15x256) + (11x16) + (2x1)$

$= 16384 + 3840 + 176 + 2$

$= (20402)_{10}$

$(88BAE)_{16}$

to binary: $(1000\ 1000\ 1011\ 1010\ 1110)_2$

to octal: $(10\ 001\ 000\ 101\ 110\ 101\ 110)_2 = (2105656)_8$

to decimal: $= (8x16^4) + (8x16^3) + (11x16^2) + (10x16^1) + (14x16^0)$

$= (8x65536) + (8x4096) + (11x256) + (10x16) + (14x1)$

$= 16384 + 3840 + 176 + 14$

$= (560046)_{10}$

$(DC4)_{16}$

to binary: $(1101\ 1100\ 0100)_2$

to octal: $(110\ 111\ 000\ 100)_2 = (6704)_8$

to decimal: $= (13x16^2) + (12x16^1) + (4x16^0)$

$= (13x256) + (12x16) + (4x1)$

$= 3328 + 192 + 4$

$= (3524)_{10}$

Solution7:

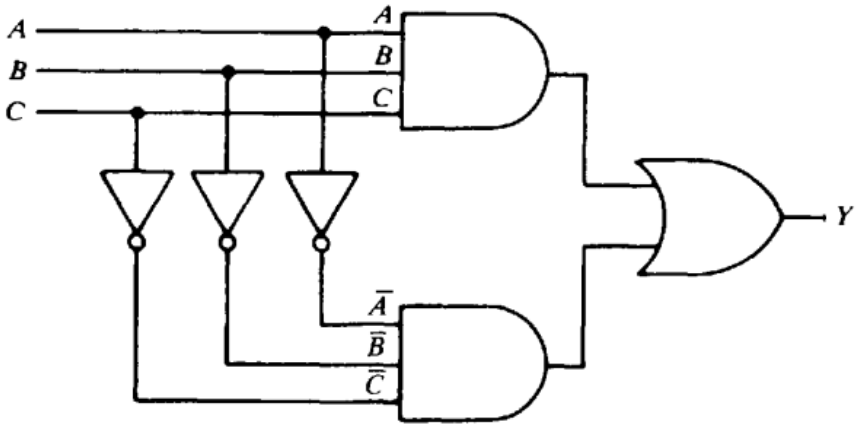

Fig. 3-18 AND-OR logic-circuit problem

Solution:

The Boolean expression for the logic circuit shown in Fig. 3-18 is

$$ABC + \bar{A}\bar{B}\bar{C} = Y$$

Solution8:

Inputs			Output	Inputs			Output
A	B	C	Y	A	B	C	Y
0	0	0	1	1	0	0	0
0	0	1	0	1	0	1	0
0	1	0	0	1	1	0	0
0	1	1	0	1	1	1	1

Solution9:

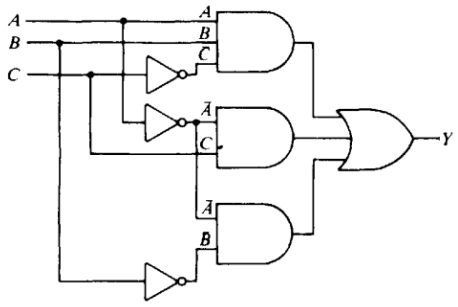

Fig. 3-19 AND-OR logic-circuit problem

Solution:

The Boolean expression for the logic circuit shown in Fig. 3-19 is $AB\overline{C} + \overline{A}C + \overline{A}\,\overline{B} = Y$. The expression reads as (A AND B AND not C) OR (not A AND C) OR (not A AND not B) equals output Y.

Solution10:

Inputs			Output	Inputs			Output
A	B	C	Y	A	B	C	Y
0	0	0	1	1	0	0	0
0	0	1	1	1	0	1	0
0	1	0	0	1	1	0	1
0	1	1	1	1	1	1	0