

B10815013

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Digital Logic Design Project 2 – ROBDD Generation

In this project, we are required to generate our own 2 PLA files (4 and 5 variables).

4 Variables Boolean Function:

$$F = a'bcd + b'd + ab'c' + a'b'c'd' + a'bcd'$$

.pla file of 4 variable Boolean function:

```
.i 4
.o 1
.ilb a b c d
.ob F
.p 5
0111 1
-0-1 1
100- 1
0000 1
0110 1
.e
```

4 variable OBDD .dot file:

```
digraph OBDD {
    {rank=same 1 }
    {rank=same 2 3 }
    {rank=same 4 5 6 7 }
    {rank=same 8 9 10 11 12 13 14 15 }

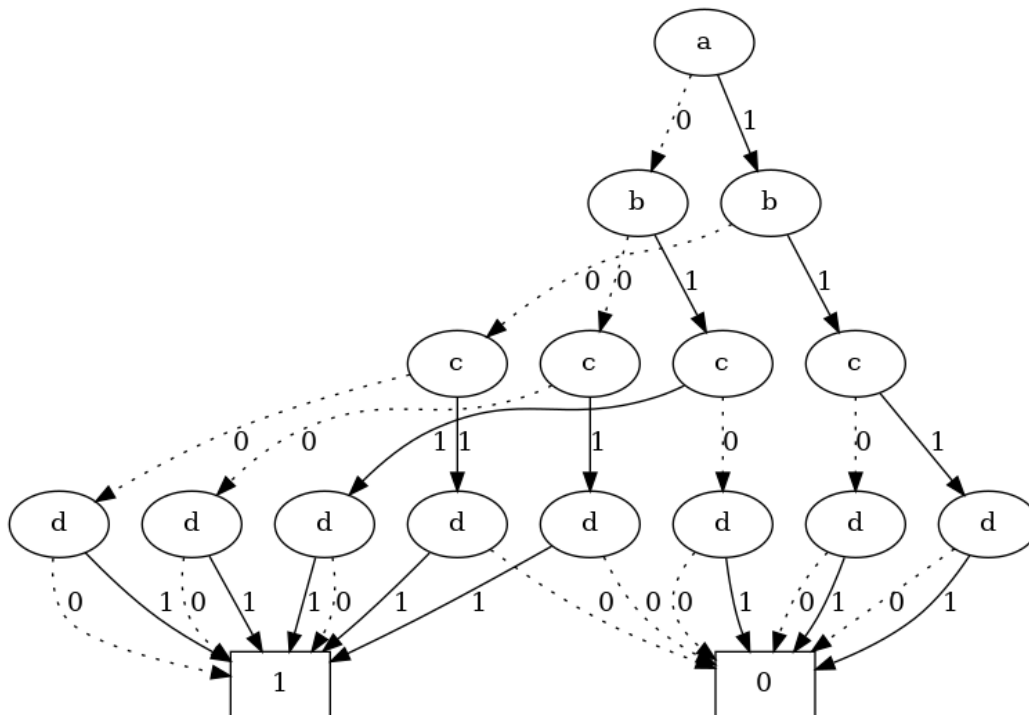
    0 [label="0", shape=box]
    1 [label="a"]
    2 [label="b"]
    4 [label="c"]
    8 [label="d"]
    9 [label="d"]
    5 [label="c"]
    10 [label="d"]
    11 [label="d"]
    3 [label="b"]
    6 [label="c"]
    12 [label="d"]
    13 [label="d"]
    7 [label="c"]
    14 [label="d"]
    15 [label="d"]
    16 [label="1", shape=box]
```

```

1 -> 2 [label="0", style=dotted]
1 -> 3 [label="1", style=solid]
2 -> 4 [label="0", style=dotted]
2 -> 5 [label="1", style=solid]
4 -> 8 [label="0", style=dotted]
4 -> 9 [label="1", style=solid]
8 -> 16 [label="0", style=dotted]
8 -> 16 [label="1", style=solid]
9 -> 0 [label="0", style=dotted]
9 -> 16 [label="1", style=solid]
5 -> 10 [label="0", style=dotted]
5 -> 11 [label="1", style=solid]
10 -> 0 [label="0", style=dotted]
10 -> 0 [label="1", style=solid]
11 -> 16 [label="0", style=dotted]
11 -> 16 [label="1", style=solid]
3 -> 6 [label="0", style=dotted]
3 -> 7 [label="1", style=solid]
6 -> 12 [label="0", style=dotted]
6 -> 13 [label="1", style=solid]
12 -> 16 [label="0", style=dotted]
12 -> 16 [label="1", style=solid]
13 -> 0 [label="0", style=dotted]
13 -> 16 [label="1", style=solid]
7 -> 14 [label="0", style=dotted]
7 -> 15 [label="1", style=solid]
14 -> 0 [label="0", style=dotted]
14 -> 0 [label="1", style=solid]
15 -> 0 [label="0", style=dotted]
15 -> 0 [label="1", style=solid]
}

```

4 variable OBDD diagram in graphviz:



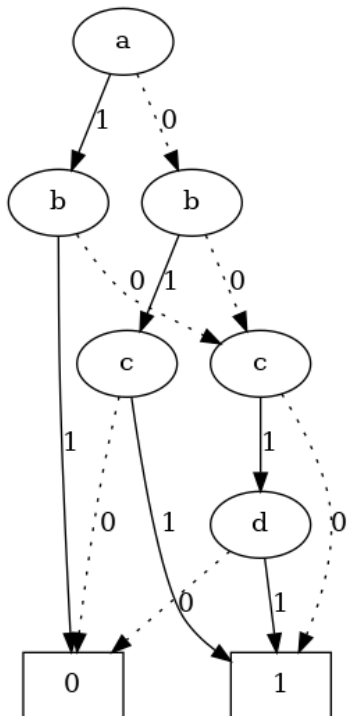
4 variable ROBDD .dot file:

```
digraph OBDD {
    {rank=same 1 }
    {rank=same 2 3 }
    {rank=same 4 5 }
    {rank=same 9 }

    0 [label="0", shape=box]
    1 [label="a"]
    2 [label="b"]
    4 [label="c"]
    9 [label="d"]
    5 [label="c"]
    3 [label="b"]
    16 [label="1", shape=box]

    1 -> 2 [label="0", style=dotted]
    1 -> 3 [label="1", style=solid]
    2 -> 4 [label="0", style=dotted]
    2 -> 5 [label="1", style=solid]
    4 -> 16 [label="0", style=dotted]
    4 -> 9 [label="1", style=solid]
    9 -> 0 [label="0", style=dotted]
    9 -> 16 [label="1", style=solid]
    5 -> 0 [label="0", style=dotted]
    5 -> 16 [label="1", style=solid]
    3 -> 4 [label="0", style=dotted]
    3 -> 0 [label="1", style=solid]
}
```

4 variable ROBDD diagram in graphviz:



5 Variables Boolean Function:

$$F = abcde + a'ce' + bd'e + b'c' + a'bc'de' + ab'cd'e + a'b'e'$$

.pla file of 5 variable Boolean function:

```
.i 5
.o 1
.ilb a b c d e
.ob F
.p 7
11111 1
0-1-0 1
-1-01 1
-00-- 1
01010 1
10101 1
00--0 1
.e
```

5 variable OBDD .dot file:

```
digraph OBDD {
    {rank=same 1 }
    {rank=same 2 3 }
    {rank=same 4 5 6 7 }
    {rank=same 8 9 10 11 12 13 14 15 }
    {rank=same 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 }

    0 [label="0", shape=box]
    1 [label="a"]
    2 [label="b"]
    4 [label="c"]
    8 [label="d"]
    16 [label="e"]
    17 [label="e"]
    9 [label="d"]
    18 [label="e"]
    19 [label="e"]
    5 [label="c"]
    10 [label="d"]
    20 [label="e"]
    21 [label="e"]
    11 [label="d"]
    22 [label="e"]
    23 [label="e"]
    3 [label="b"]
    6 [label="c"]
    12 [label="d"]
    24 [label="e"]
    25 [label="e"]
}
```

```

13 [label="d"]
26 [label="e"]
27 [label="e"]
7 [label="c"]
14 [label="d"]
28 [label="e"]
29 [label="e"]
15 [label="d"]
30 [label="e"]
31 [label="e"]
32 [label="1", shape=box]

1 -> 2 [label="0", style=dotted]
1 -> 3 [label="1", style=solid]
2 -> 4 [label="0", style=dotted]
2 -> 5 [label="1", style=solid]
4 -> 8 [label="0", style=dotted]
4 -> 9 [label="1", style=solid]
8 -> 16 [label="0", style=dotted]
8 -> 17 [label="1", style=solid]
16 -> 32 [label="0", style=dotted]
16 -> 32 [label="1", style=solid]
17 -> 32 [label="0", style=dotted]
17 -> 32 [label="1", style=solid]
9 -> 18 [label="0", style=dotted]
9 -> 19 [label="1", style=solid]
18 -> 32 [label="0", style=dotted]
18 -> 0 [label="1", style=solid]
19 -> 32 [label="0", style=dotted]
19 -> 0 [label="1", style=solid]
5 -> 10 [label="0", style=dotted]
5 -> 11 [label="1", style=solid]
10 -> 20 [label="0", style=dotted]
10 -> 21 [label="1", style=solid]
20 -> 0 [label="0", style=dotted]
20 -> 32 [label="1", style=solid]
21 -> 32 [label="0", style=dotted]
21 -> 0 [label="1", style=solid]
11 -> 22 [label="0", style=dotted]
11 -> 23 [label="1", style=solid]
22 -> 32 [label="0", style=dotted]
22 -> 32 [label="1", style=solid]
23 -> 32 [label="0", style=dotted]
23 -> 0 [label="1", style=solid]
3 -> 6 [label="0", style=dotted]
3 -> 7 [label="1", style=solid]
6 -> 12 [label="0", style=dotted]
6 -> 13 [label="1", style=solid]
12 -> 24 [label="0", style=dotted]
12 -> 25 [label="1", style=solid]
24 -> 32 [label="0", style=dotted]
24 -> 32 [label="1", style=solid]
25 -> 32 [label="0", style=dotted]
25 -> 32 [label="1", style=solid]

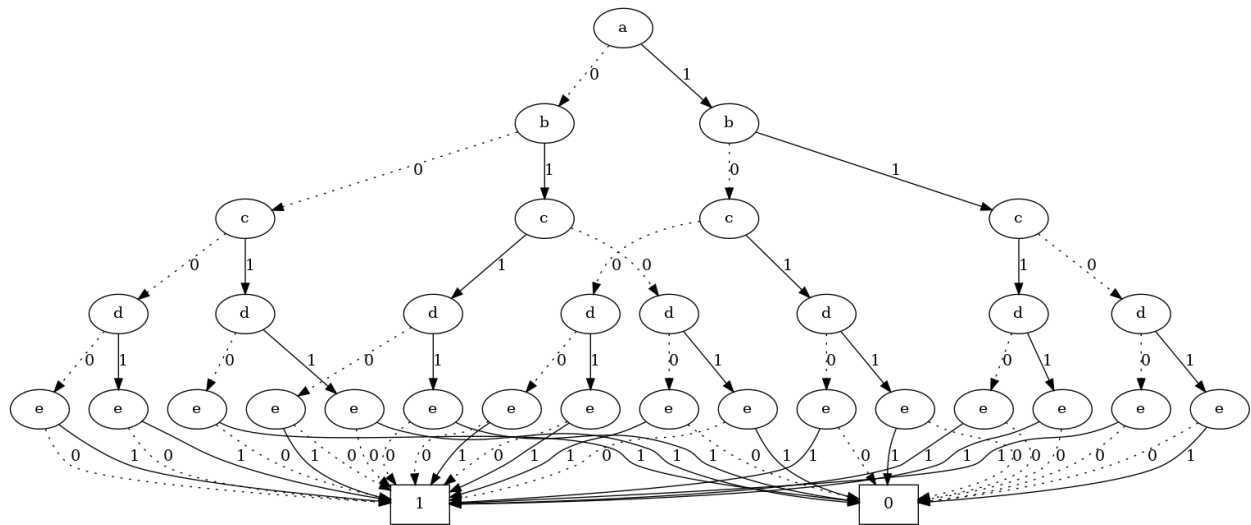
```

```

13 -> 26 [label="0", style=dotted]
13 -> 27 [label="1", style=solid]
26 -> 0 [label="0", style=dotted]
26 -> 32 [label="1", style=solid]
27 -> 0 [label="0", style=dotted]
27 -> 0 [label="1", style=solid]
7 -> 14 [label="0", style=dotted]
7 -> 15 [label="1", style=solid]
14 -> 28 [label="0", style=dotted]
14 -> 29 [label="1", style=solid]
28 -> 0 [label="0", style=dotted]
28 -> 32 [label="1", style=solid]
29 -> 0 [label="0", style=dotted]
29 -> 0 [label="1", style=solid]
15 -> 30 [label="0", style=dotted]
15 -> 31 [label="1", style=solid]
30 -> 0 [label="0", style=dotted]
30 -> 32 [label="1", style=solid]
31 -> 0 [label="0", style=dotted]
31 -> 32 [label="1", style=solid]
}

```

5 variable OBDD diagram in graphviz:



5 variable ROBDD .dot file:

```

digraph OBDD {
    {rank=same 1 }
    {rank=same 2 3 }
    {rank=same 4 5 6 7 }
    {rank=same 10 11 13 14 }
    {rank=same 19 20 26 28 31 }
}

```

```

0 [label="0", shape=box]
1 [label="a"]
2 [label="b"]
4 [label="c"]
19 [label="e"]
5 [label="c"]
10 [label="d"]
20 [label="e"]
11 [label="d"]
3 [label="b"]
6 [label="c"]
13 [label="d"]
26 [label="e"]
7 [label="c"]
14 [label="d"]
28 [label="e"]
31 [label="e"]
32 [label="1", shape=box]

```

```

1 -> 2 [label="0", style=dotted]
1 -> 3 [label="1", style=solid]
2 -> 4 [label="0", style=dotted]
2 -> 5 [label="1", style=solid]
4 -> 32 [label="0", style=dotted]
4 -> 19 [label="1", style=solid]
19 -> 32 [label="0", style=dotted]
19 -> 0 [label="1", style=solid]
5 -> 10 [label="0", style=dotted]
5 -> 11 [label="1", style=solid]
10 -> 20 [label="0", style=dotted]
10 -> 19 [label="1", style=solid]
20 -> 0 [label="0", style=dotted]
20 -> 32 [label="1", style=solid]
11 -> 32 [label="0", style=dotted]
11 -> 19 [label="1", style=solid]
3 -> 6 [label="0", style=dotted]
3 -> 7 [label="1", style=solid]
6 -> 32 [label="0", style=dotted]
6 -> 13 [label="1", style=solid]
13 -> 26 [label="0", style=dotted]
13 -> 0 [label="1", style=solid]
26 -> 0 [label="0", style=dotted]
26 -> 32 [label="1", style=solid]
7 -> 14 [label="0", style=dotted]
7 -> 31 [label="1", style=solid]
14 -> 28 [label="0", style=dotted]
14 -> 0 [label="1", style=solid]
28 -> 0 [label="0", style=dotted]
28 -> 32 [label="1", style=solid]
31 -> 0 [label="0", style=dotted]
31 -> 32 [label="1", style=solid]

```

```

}

```

5 variable ROBDD diagram in graphviz:

