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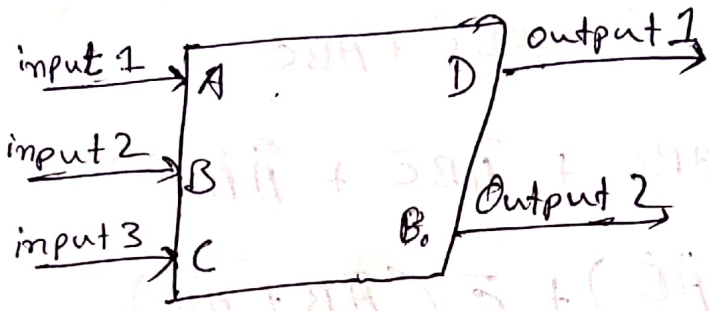
Full Subtractor:



Truth Table:

Input			Output	
A	B	C	D	B_0
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	0	1
1	0	0	1	0
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1

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Equation:

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

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

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

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

$$= A \oplus B \oplus C$$

[$x\bar{y} + \bar{x}y = \overline{x \oplus y}$
$\bar{x}y + x\bar{y} = x \oplus y$]

$$B_0 = \bar{A}\bar{B}C + \bar{A}B\bar{C} + \bar{A}BC + ABC$$

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

[$X = X + X + X$]

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

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

$$= \bar{A}C + \bar{A}B + BC$$ [$x + \bar{x} = 1$]

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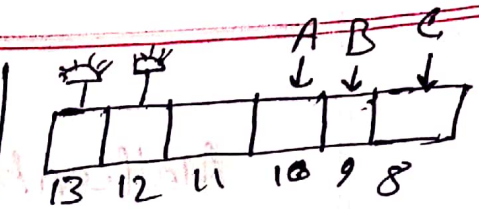
Sketch :




```
byte A,B,C,D,E,F,G;

void setup(){

    pinMode(10, INPUT);
    pinMode(9, INPUT);
    pinMode(8, INPUT);
    pinMode(12, OUTPUT);
    pinMode(11, OUTPUT);

}

void loop(){

    A = digitalRead(10);
    B = digitalRead(9);
    C = digitalRead(8);

    D = !A;
    digitalWrite(12, A^B^C);
    digitalWrite(13, (D&C)|(D&B)|(B&C));

}
```

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