FULL SUBTRACTOR

(i) **Definition** - The full-subtractor is a combinational circuit which is used to perform subtraction of three single bits.

(ii) **No. of inputs and outputs**

Number of inputs – 3

Number of outputs – 2

(iii) **Assigning symbols**

Symbols of inputs – X, Y, Z

Symbols of outputs – D (difference) and B (borrow)

(iv) **Truth table**

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<tr>
<th>INPUT</th>
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<th>OUTPUT</th>
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(v) **Boolean equation**

\[
D = X'Y'Z + X'YZ' + XY'Z' + XYZ
\]

\[
= X' (Y'Z + YZ') + X (Y'Z' + YZ)
\]

\[
= X'(Y (XOR) Z) + X(Y (XNOR) Z)
\]

\[
= X (XOR) Y (XOR) Z
\]

\[
B = X'Y'Z + X'YZ' + X'YZ + XYZ
\]

\[
= Z (X'Y + XY') + X'Y (Z' + Z)
\]

\[
= Z (X (XOR) Y) + X'Y
\]

(vi) **Logic Diagram**

![Logic Diagram](http://www.knowelectronics.org/full-subtractor/)