**Determining Logic Gates Required for 2-bit Binary Division**

**Quotient**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| A1 | A0 | B1 | B0 | Q1 | Q0 |
| 0 | 0 | 0 | 0 | 0 - NA | 0 - NA |
| 0 | 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 1 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 - NA | 0 - NA |
| 0 | 1 | 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 | 0 | 0 |
| 0 | 1 | 1 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 - NA | 0 - NA |
| 1 | 0 | 0 | 1 | 1 | 0 |
| 1 | 0 | 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 | 0 | 0 |
| 1 | 1 | 0 | 0 | 0 - NA | 0 - NA |
| 1 | 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 1 | 0 | 1 |

NA = (B1+B0)’ = (B1 nor B0);

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Q0 | B-00 | B-01 | B-11 | B-10 |
| A-00 |  |  |  |  |
| A-01 |  | 1 |  |  |
| A-11 |  | 1 | 1 | 1 |
| A-10 |  |  |  | 1 |

Q0 = (A0.B1’.B0 + A1.A0.B0 + A1.B1.B0’) = ((A0 nand B1’ nand B0) nand (A1 nand A0 nand B0) nand (A1 nand B1 nand B0’));

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Q1 | B-00 | B-01 | B-11 | B-10 |
| A-00 |  |  |  |  |
| A-01 |  |  |  |  |
| A-11 |  | 1 |  |  |
| A-10 |  | 1 |  |  |

Q1 = (A1.B1’.B0) = (A1’ nor B1 nor B0’);

**Remainder**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| A1 | A0 | B1 | B0 | R1 | R0 |
| 0 | 0 | 0 | 0 | 0 – NA | 0 - NA |
| 0 | 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 1 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 – NA | 0 - NA |
| 0 | 1 | 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 0 | 0 | 1 |
| 0 | 1 | 1 | 1 | 0 | 1 |
| 1 | 0 | 0 | 0 | 0 – NA | 0 - NA |
| 1 | 0 | 0 | 1 | 0 | 0 |
| 1 | 0 | 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 | 1 | 0 |
| 1 | 1 | 0 | 0 | 0 – NA | 0 - NA |
| 1 | 1 | 0 | 1 | 0 | 0 |
| 1 | 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 1 | 0 | 0 |

NA = (B1+B0)’ = (B1 nor B0);

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| R0 | 00 | 01 | 11 | 10 |
| 00 |  |  |  |  |
| 01 |  |  | 1 | 1 |
| 11 |  |  |  | 1 |
| 10 |  |  |  |  |

R0 = (A1’.A0.B1 + A0.B1.B0’) = ((A1’ nand A0 nand B1) nand (A0 nand B1 nand B0’));

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| R1 | 00 | 01 | 11 | 10 |
| 00 |  |  |  |  |
| 01 |  |  |  |  |
| 11 |  |  |  |  |
| 10 |  |  | 1 |  |

R1 = (A1.A0’.B1.B0) = ((A1 nand A0’nand B1)’ nor B0’);