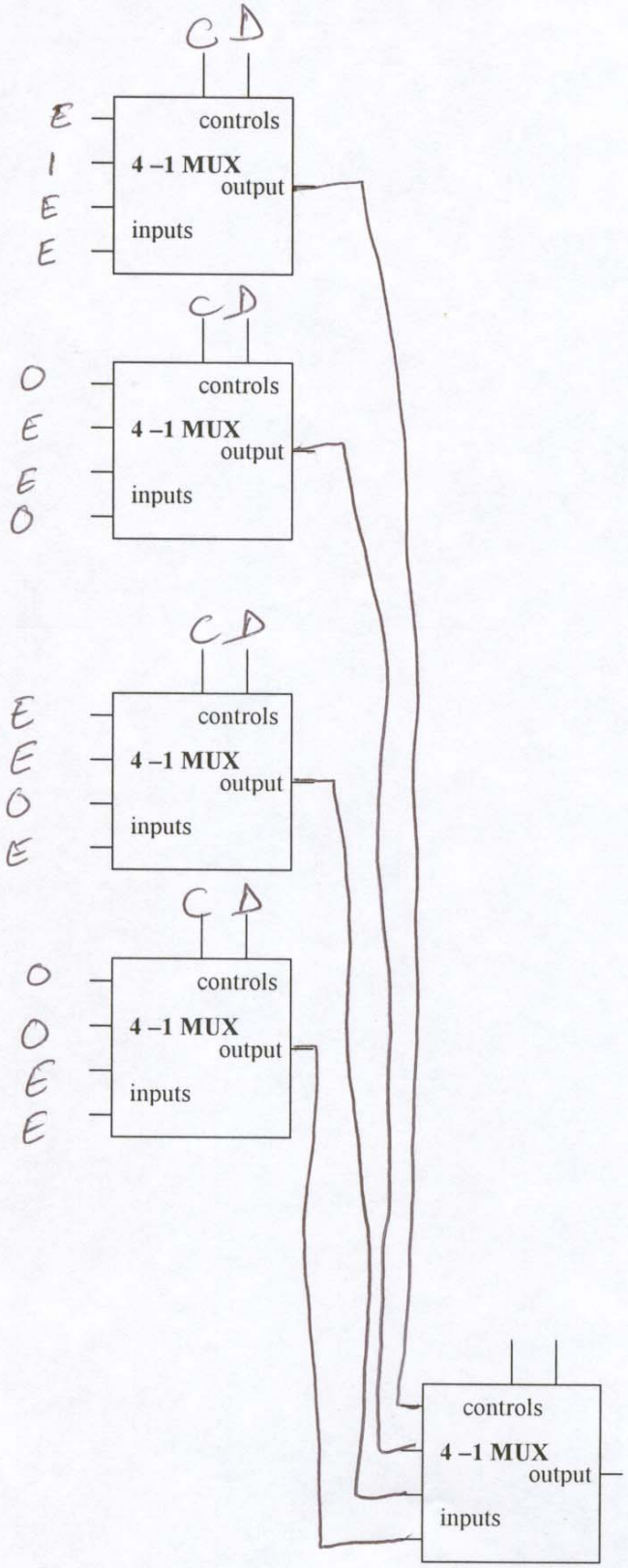
1. (15 points) The function F is true if the binary input is a prime number ('0' is not a prime number). Fill in the truth table, and solve using the network of multiplexers shown on the next page.

| Decimal | ABCDE | F | F(E) |
|---|---|---|---|
| 0 | 00000 | 0 | E |
| 1 | 00001 | 1 | |
| 2 | 00010 | 1 | 1 |
| 3 | 00011 | 1 | |
| 4 | 00100 | 0 | E |
| 5 | 00101 | 1 | |
| 6 | 00110 | 0 | E |
| 7 | 00111 | 1 | |
| 8 | 01000 | 0 | 0 |
| 9 | 01001 | 0 | |
| 10 | 01010 | 0 | E |
| 11 | 01011 | 1 | |
| 12 | 01100 | 0 | E |
| 13 | 01101 | 1 | |
| 14 | 01110 | 0 | 0 |
| 15 | 01111 | 0 | |
| 16 | 10000 | 0 | E |
| 17 | 10001 | 1 | |
| 18 | 10010 | 0 | E |
| 19 | 10011 | 1 | |
| 20 | 10100 | 0 | 0 |
| 21 | 10101 | 0 | |
| 22 | 10110 | 0 | E |
| 23 | 10111 | 1 | |
| 24 | 11000 | 0 | 0 |
| 25 | 11001 | 0 | |
| 26 | 11010 | 0 | 0 |
| 27 | 11011 | 0 | |
| 28 | 11100 | 0 | E |
| 29 | 11101 | 1 | |
| 30 | 11110 | 0 | E |
| 31 | 11111 | 1 | |

1 (Continued) Specify the MSB and LSB bits properly.

b)



7) (15 points) Your input is in EXCESS-3 signal and your output is:

$$F = \begin{cases} 1 & \text{if the input is a valid single digit in the date (07-23-2004)} \\ 0 & \text{otherwise} \end{cases}$$

Find the minimal SOP form.

| Decimal | ABCD | F |
|---|---|---|
| 0 | 0000 | X |
| 1 | 0001 | X |
| 2 | 0010 | X |
| 3 | 0011 | 1 |
| 4 | 0100 | 0 |
| 5 | 0101 | 1 |
| 6 | 0110 | 1 |
| 7 | 0111 | 1 |
| 8 | 1000 | 0 |
| 9 | 1001 | 0 |
| 10 | 1010 | 1 |
| 11 | 1011 | 0 |
| 12 | 1100 | 0 |
| 13 | 1101 | X |
| 14 | 1110 | X |
| 15 | 1111 | X |

$f = \bar{A}D + C\bar{D}$

| AB \ CD | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | X | X | 1 | X |
| 01 | 0 | 1 | 1 | 1 |
| 11 | 0 | X | X | X |
| 10 | 0 | 0 | 0 | 1 |

$\bar{A}D$

$C\bar{D}$