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ESC201
Total Marks: 5

Mini-Quiz VI

01/04/2025
Time: 10 minutes

Instructions

- Please write your name and roll number first.
- Read the question carefully and answer it in the question paper itself.

1) We need to design a digital hardware which classifies the decimal numbers between 0 to 15 as prime numbers i.e. the hardware outputs a logic "1" if the decimal number is prime and logic "0" otherwise.

(a) Write the truth table for this hardware design. (1 mark)

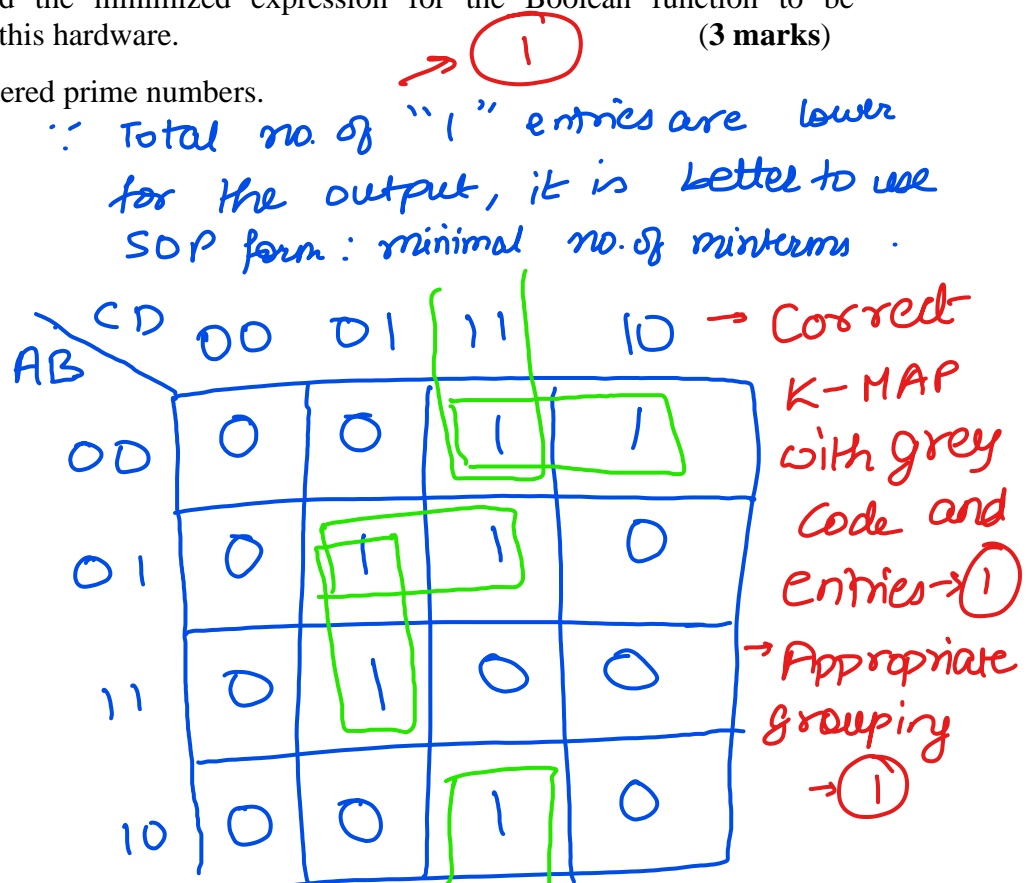
(b) Looking at the truth table realized in part (a), would it be optimal to use the SOP form or POS form to represent this Boolean function? Why? (1 mark)

(c) Using K-Map, find the minimized expression for the Boolean function to be implemented using this hardware. (3 marks)

FYI: 0 and 1 are not considered prime numbers.

Truth table

a)	A	B	C	D	Out
0	0	0	0	0	0
1	0	0	0	1	0
2	0	0	1	0	1
3	0	0	1	1	1
4	0	1	0	0	0
5	0	1	0	1	1
6	0	1	1	0	0
7	0	1	1	1	1
8	1	0	0	0	0
9	1	0	0	1	0
10	1	0	1	0	0
11	1	0	1	1	1
12	1	1	0	0	0
13	1	1	0	1	1
14	1	1	1	0	0
15	1	1	1	1	0



$$\text{Out} = \bar{B}CD + \bar{A}\bar{B}C + \bar{A}B\bar{D} + B\bar{C}\bar{D}$$

Note: This final solution can be different for different grouping styles.

→ if 4 minterms → 1 if more than 4 → 0.5