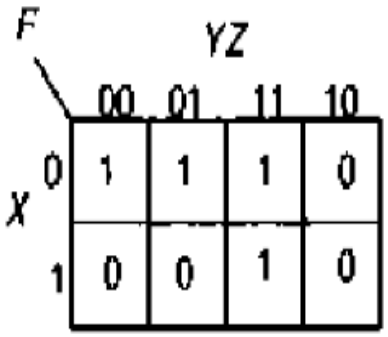
Name: G.MADHU LATHA
Batch:COMET.fwc029
Date:

GATE QUESTION
EEE 2010 Q52

Question :

The following Karnaugh map represents a function F:



Solution for MCQ 1.52

The given Karnaugh map for the function F is:

F	YZ			
X	00	01	11	10
0	1	1	1	0
1	0	0	1	0

To minimize the function F, we group the adjacent 1's in the K-map.

Step 1: Identify all 1's and their corresponding minterms.

- $X = 0, Y = 0, Z = 0 \implies \overline{XYZ}$ (Cell 00)
- $X = 0, Y = 0, Z = 1 \implies \overline{XY}Z$ (Cell 01)
- $X = 0, Y = 1, Z = 1 \implies \overline{X}YZ$ (Cell 11)
- $X = 1, Y = 1, Z = 1 \implies XYZ$ (Cell 11, row 1)

Step 2: Group the 1's.

We can form two prime implicants:

1. **Group 1 (Pair):** Group the 1's in cells $(X = 0, YZ = 00)$ and $(X = 0, YZ = 01)$.

F	YZ			
X	00	01	11	10
0	1	1	1	0
1	0	0	1	0

This group eliminates Z (since Z changes from 0 to 1 while other variables are constant) and simplifies to $\overline{XY}$.

2. **Group 2 (Pair):** Group the 1's in cells $(X = 0, YZ = 11)$ and $(X = 1, YZ = 11)$.

F		YZ			
X		00	01	11	10
	0	1	1	1	0
	1	0	0	1	0

This group eliminates X (since X changes from 0 to 1 while other variables are constant) and simplifies to YZ.

Step 3: Write the minimized Boolean expression. The minimized form of the function F is the sum of these prime implicants:

$$F = \overline{XY} + YZ$$

Comparing this with the given options: (A) $F = \overline{XY} + YZ$ (B) $F = \overline{XY} + YZ$ (C) $F = \overline{XY} + Y\overline{Z}$ (D) $F = \overline{XY} + Y\overline{Z}$

Both options (A) and (B) match our derived minimized expression. Assuming only one is the correct option in a multiple-choice setting, if there were a distinction between (A) and (B) in the original problem format, one would be chosen. Based on the image provided, (B) is indicated as the correct option.

The final answer is $\boxed{F = \overline{XY} + YZ}$.