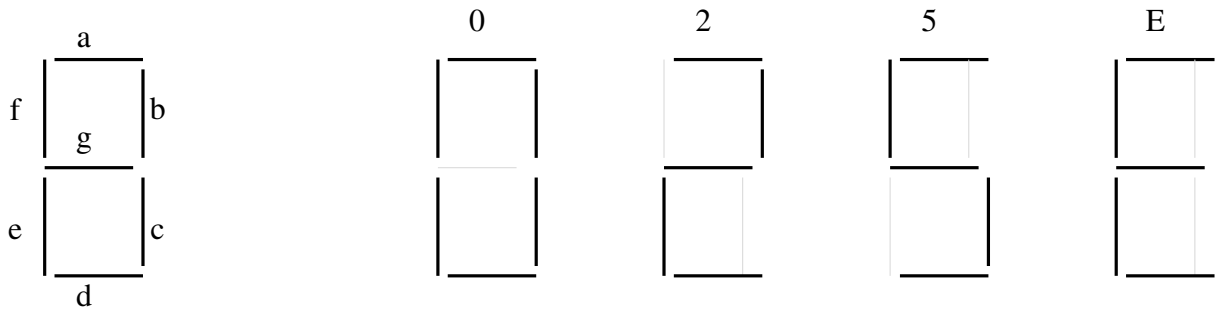
Two products are sold from a vending machine, which has two push buttons P_1 and P_2. When a button is pressed, the price of the corresponding product is displayed in a 7-segment display.

- If no buttons are pressed, '0' is displayed, signifying Rs. 0.
- If only P_1 is pressed, '2' is displayed, signifying Rs. 2.
- If only P_2 is pressed, '5' is displayed, signifying Rs. 5.
- If both P_1 and P_2 are pressed, 'E' is displayed, signifying "Error".

The names of the segments in the 7-segment display and the glow of the display for '0', '2', '5' and 'E' are shown below:



Consider:

(i) Push button pressed / not pressed is equivalent to logic 1 / 0 respectively.

(ii) A segment glowing / not glowing in the display is equivalent to logic 1 / 0 respectively.

Q.60 What are the minimum numbers of NOT gates and 2-input OR gates required to design the logic of the driver for this 7-segment display?

(A) 3 NOT and 4 OR

(B) 2 NOT and 4 OR

(C) 1 NOT and 3 OR

(D) 2 NOT and 3 OR

Answer: (D) 2 NOT and 3 OR

Explanation:

From the previous question (Q59), the simplified logic expressions for the required segments were:

- $g = \overline{P_1} \cdot P_2$
- $d = c + e$
- $e = b + c$

We analyze gate usage:

- To implement $g = \overline{P_1} \cdot P_2$ using only NOT and OR gates, apply DeMorgan's Theorem:
$$g = \overline{P_1} \cdot P_2 = \overline{(\overline{\overline{P_1}} + \overline{P_2})}$$
This form needs **2 NOTs** and **1 OR**.
- $e = b + c$ requires **1 OR** gate.
- $d = c + e$ requires another **1 OR** gate.

Total:

- NOT gates: **2**
- OR gates: **3**

Therefore, the correct answer is **(D)**.