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:

|   | a   | 0 | 2 | 5 | E |
|---|-----|---|---|---|---|
| f | b g |   |   |   |   |
| e | c   |   |   |   |   |

## **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.59 If segments a to g are considered as functions of  $P_1$  and  $P_2$ , then which of the following is correct?

(A) 
$$q = \overline{P_1} + P_2$$
,  $d = c + e$ 

(B) 
$$g = P_1 + P_2$$
,  $d = c + e$ 

(C) 
$$g = \overline{P_1} + P_2$$
,  $e = b + c$ 

(D) 
$$g = P_1 + P_2$$
,  $e = b + c$ 

## **Solution:**

- g segment glows for 2, 5, and E, but not for 0.
- That means:

$$g = \overline{P_1} \cdot P_2 + P_1 \cdot \overline{P_2} + P_1 \cdot P_2 = P_1 + P_2$$

- Only option (B) and (D) satisfy  $g = P_1 + P_2$ .
- For option (B), d=c+e is consistent with the ON segments for all digits (0, 2, 5, E).

Therefore, the correct answer is: (B)