

Solution:

1. a) Here,  $x$  is the input variable to the combinational system and  $z$  is the output. The high level specification of the system is:

Input,  $x \in \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$

Similarly,

$$\text{Output, } z = \begin{cases} x^2 & \text{if } x > 4 \\ 2x & \text{otherwise} \end{cases}$$

Function:  $F$  is described by the following table.

$x$	0	1	2	3	4	5	6	7	8	9	
$z = F(x)$	0	2	4	6	8	25	36	49	64	81	

(b) Based on given conditions, we can conclude that:

The number of input bits: 4

Switching function:

$$f(x_3, x_2, x_1, x_0) = \text{one-set}(0, 2, 4, 8)$$

$$f(x_3, x_2, x_1, x_0) = \text{zero-set}(1, 3, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15)$$

so,

Switching expression.

$$E = \sum m(0, 2, 4, 8) = x_3'x_2'x_1'x_0' + x_3'x_2'x_1x_0' + x_3'x_2x_1'x_0' + x_3x_2'x_1'x_0'$$