**Fault -1**

1. K(a,b,c)=T(a,c,T(a,b,c)) The output of gate ‘T’ is defined in following table. The gate T may suffer from inversion fault (output opposite). Which input combinations may be used for fault detect in ‘K’?

Give reason as given in following example. Assume at most one T has fault. MS19FL

Example: M(a,b,c)=T(a,T(a,b,c),b) one may use 000, 001, 100 or 101. Reason: Why 001 because T(0,1/0,0) i.e. T(0,0,0) and T(0,1,0) are opposite. Why not 011 because T(0,0/1,1) are same?

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Gate T | 0000 | 0010 | 0101 | 0110 | 1001 | 1011 | 1100 | 1111 |

1. A circuit (input a,b,c,d,e,f) is designed. It outputs true when abcdef19. However input b is suffering from stuck at one (1) fault. For which inputs the output is true. Example: The input ‘c’ is suffering from stuck at zero (0) fault. When input is [19,23][27,63] the output is true. ES18FL
2. An faulty ‘AND’ gate produces wrong output when input is (0,1). Design fault tolerant ‘and’ gate using minimum number of ‘and’ gates. Example: When wrong output is produced for inputs (0,1) and (1,0) then fault tolerant gate is and(and(x,y),and(x,y)) correct and(x,y)=1 when x=y=1. MS16FL
3. A, B,…G are possible faults in a hardware. Which input combination(s) should be used to find the fault? Use least number of tests (input combinations). Assume that there is at most one fault. [Notation: Input 011 outputs 1011 when there is no fault in the system or there is fault ABE or G. When there is fault F then on the same input output is 1010.] ES15FL

[Example: when A, B, C are possible faults then 2 tests {000,101} can be used.

1101,1010no fault 1001,1010A 1001,0101B 1101,1011C ].

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| Input | Output | Output in case of fault | | | | | | |
| xyz |  | A | B | C | D | E | F | G |
| 000 | 1101 | 1001 | 1001 | 1101 | 1101 | 1101 | 1101 | 1010 |
| 001 | 0101 | 1101 | 1101 | 0101 | 0101 | 1010 | 0000 | 0101 |
| 010 | 1111 | 1111 | 1111 | 1111 | 1010 | 1111 | 1001 | 0110 |
| 011 | 1011 | 1011 | 1011 | 1111 | 1111 | 1011 | 1010 | 1011 |
| 100 | 0010 | 0011 | 0011 | 1100 | 1100 | 0010 | 1010 | 0010 |
| 101 | 1010 | 1010 | 0101 | 1011 | 1011 | 1010 | 1101 | 1010 |
| 110 | 0110 | 1101 | 1101 | 0110 | 0110 | 0110 | 1010 | 0110 |
| 111 | 0111 | 0111 | 0111 | 1101 | 1101 | 0111 | 0101 | 1111 |