

Q.1: a.  $F(a,b,c) = ((a.b) + (c.d))'$   
 $= (a.b)' \cdot (c.d)'$   
 $= (a'+b') \cdot (c'+d')$

$\rightarrow \frac{dg}{da} = g(a=0) \oplus g(a=1)$   
 $= (c'+d') \oplus b'(c'+d') = 1$

$\frac{dg}{da}$  must be 1 when output is sensitive to a

$\rightarrow (c'+d') \oplus b'(c'+d') = 1$

let  $c'+d' = w$

$w \oplus b' \cdot w = 1$

g is sensitive to not a when  $bcd = 100, 101, 110$ .

b. Use Boolean Difference :

$F(a,b,c) = ((a.b) + (c.d))'$

e.  $a.b$  ,  $f = c.d$

$f(e,f) = (e+f)' \cdot e' \cdot f'$

$\frac{dg}{da} = f' \oplus 0 \cdot f'$

$\therefore$  g is sensitive to not e when  $f=0$

$cd = 01, 10, 00$

c.  $a \geq 0 \Rightarrow b \geq 0 \Rightarrow e \geq 0$

The test vectors  $abcd = 1110, 1101, 1100$

$\rightarrow$  a test  $abcd = 0110, 0101, 0100$

d.  $b \leq a \equiv a \leq a$

⇒ The test vector  $\overline{abcd} = 1110, 1101, 1100$

$b \leq a$  test vector  $\overline{abcd} = 1010, 1001, 1000$

e.  $c \leq a \equiv d \leq a \equiv f \leq a$

∴  $\overline{abcd} = 1011, 0111, 0011$

→  $c \leq a$  test vector  $\overline{abcd} = 1001, 0101, 0001$

f.  $d \leq a \equiv c \leq a$

∴  $\overline{abcd} = 1011, 0111, 0011$

→  $d \leq a$  test vector = 1010, 0110, 0010

g.  $e \leq a \equiv a \leq a$

$\overline{abcd} = 1110, 1101, 1100$

$e \leq a \equiv f \leq a \equiv g \leq a$

∴  $\overline{abcd} = 0000, 0001, 0010, 0100, 0101, 0110, 1000, 1001, 1010$

h.  $f \leq a \equiv c \leq a$

$\overline{abcd} = 1011, 0111, 0011$

→  $f \leq a \equiv e \leq a$

$\overline{abcd} = 0000, 0001, 0010, 0100, 0101, 0110, 1000, 1001, 1010$

i.  $g \leq a \equiv d \leq a$

$\overline{abcd} = 0000, 0001, 0010, 0100, 0101, 0110, 1000, 1001, 1010$

→  $g \leq a$ :

$\overline{abcd} = 1101, 1110, 0011, 0111, 1011, 1111$



Q.2 → a.

iii.  $d = a = 0$

$\overline{abc} = 011, 000, 111 \rightarrow$  with Fault  $D=0$   
without Fault  $D=1$

F = D.e

when  $e=0 \rightarrow F=0$

$e=1 \rightarrow F=D$

So the test vector for " $d = a = 0$ "  $\overline{abc} = 000$

(2).  $d = a = 1$

$\overline{abc} = 100 \rightarrow$  with Fault  $D=1$   
without Fault  $D=0$

F = D.e

when  $e=0 \rightarrow F=0$

$e=1 \rightarrow F=D$

So, the test vector for " $d = a = 1$ ",  $\overline{abc} = 100$

b.

(1).  $e = a = 0$

$bc = 00, e=1$ : Fault,  $e=0$ : No Fault

→

F = D.e

$d=0 \rightarrow F=0$

$d=1 \rightarrow F=D$

$d = (a.D)$ , a must be 0

$e = a = 0$  test vector  $\overline{abc} = 000$



(2). e 3-a-1

$\overline{bc} = 01, 10, 11 \rightarrow D=1$  with fault  
("a" must be zero)  $D=0$  without fault

$\rightarrow$   
e 3-a-1  $\rightarrow \overline{abc} = 001, 010, 011$

Q.3:

a1a0 b1b0 part (a)	xyz	c2c1c0 part (b)	x(y=0)z	c2c1c0 part (c)
1101	010	010	000	010
0110	001	000	001	000
0011	001	001	001	001
1001	010	110	000	100
0100	010	101	000	110
0010	001	011	001	110
0001	001	100	001	110
		Signature $\rightarrow$	<del>001</del>	Sig $\rightarrow$

