QUESTION 2

193079024

SARVESH KALE

Q2 a.)

We are given a care set A =x1.x2 + x3.x4, we first construct the characteristic equation of the problem .

I am using +,.,^,~ to denote or , and , xor and negation

Y1 = x1 ^x2 ^x3 ^x4 so this can be written in boolean form as xnor of y1 and the expression on the right , ~(y1 ^(= x1 ^x2 ^x3 ^x4)) similarly the other two equations ~(y2^(x1.x2 ^x2.x3^x3.x4^x1.x4)) ,~(y3^(x1.x2.x3^x2.x3.x4^x3.x1.x4))

The resultant characteristic equation will be the product of the three expression written above ,

Let X= ~(y1 ^(x1 ^x2 ^x3 ^x4)) . ~(y2^(x1.x2 ^x2.x3^x3.x4^x1.x4)) . ~(y3^(x1.x2.x3^x2.x3.x4^x3.x1.x4))

Now we have to do there exist operation on A.X ,because A is our care set and we have to find the image that is those points in output vector which are true under A.X so after doing a there exist operation on x1,x2,x3,x4 ,we will obatain an expression which is a function of y1,y2,y3 because the there exist operation eliminates the variables

So we first defined the variables for bdd ,and then constructed A,and X then we constructed the bdd for A.X and then we performed the there exist operation

Image = there exist x4 (there exist x3 (there exist x2 (there exist x1(A.X))))

Where A= x1.x2 + x3.x4

X= ~(y1 ^(x1 ^x2 ^x3 ^x4)) . ~(y2^(x1.x2 ^x2.x3^x3.x4^x1.x4)) . ~(y3^(x1.x2.x3^x2.x3.x4^x3.x1.x4))

The output we got is displayed below .

```
sarvesh:q2$ ./q2a
if var.4
  !var.5
else if !var.4
  if var.5
    !var.6
  else if !var.5
    var.6
  endif var.5
endif var.4
```

So according to the ordering of variables , var.4 is y1,var.5 is y2 ,var.6 is y3.

Image = (1,0,1),(1,0,0),(0,1,0),(0,0,1) these are the output image points we obtain after traversing the above bdd .

Q2 b.)

Approach

The approach is also similar to the above question but instead of computing the image we have to compute the preimage that means the the there exist operation will now be on the output variables y1,y2,y3 and we will get a bdd in terms of x1,x2,x3,x4 . here we are asked that what input points map to the given formula

B=y1.y2 + y2.y3

For preimage computation we do the following .

We change the association of the variable on which bdd_exists has to be performed .

Preimage = there exist y3 (there exist y2 (there exist y1(B.X))))

Where X = ~(y1 ^(x1 ^x2 ^x3 ^x4)) . ~(y2^(x1.x2 ^x2.x3^x3.x4^x1.x4)) . ~(y3^(x1.x2.x3^x2.x3.x4^x3.x1.x4))

On constructing the bdd for the formula given by B , we do the exists operation .

We obtain the following result .

```
sarvesh:q2$ ./q2b
0
```

That means there is no input combination for which this formula is true so we get 0 bdd as output .