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II Semester B. Tech. CSE- Discrete Mathematics-23MAT116

Lab Exercise-1

1. Type the following at the MATLAB command prompt and obtain the answers:

Note: 1 stands for true and 0 for false

a)1<3 b) 3<2 c) 3<3 d) 1<=3 e) 3<=3 f) 1>2 g) 2>=2 h)14~=15 i) 14~=14

2. Type x=12 at the command prompt and obtain answers for the following:

a)x==13 b)x==12 c)x~= 13 d) (x==12)|(x>3) e) (x==12)|(x<3) f) (x==12)&(x>3)

g)~ (x==12)|(x>3) h) ~( (x==12)|(x>3)). What is your inference regarding results of (g) and (h)? why?

3. Create a script file by name logic.m. Type the following commands in it. What is the output?

a=1;

b=true;

c=0;

f=a&b;

g=a|b&c;

h=xor(~a,c)

v=[f, g, h]

Will there be a change in the output if 2nd line is changed to b=1. Why?

4. Create a script file by name bitstrngs.m. Consider two bit srings a and b of length 4 or more. The output of the program should be the bit strings

i) c=a and b, (ii) d=a or b (iii) e= a exor b iv)f = ~a. Convince yourself that the output is correct. Should a and b be of same length? What is the output if they are not of same length ?

5. Create a script file by name exclusiveor.m . Type the following code. What is the output? Which logical operator does it represent?

n=2;

A= dec2bin(2^n-1:-1:0)-'0';

for i = 1 : (2^n)

A(i, 3) =xor(A(i, 1), A(i, 2));

end

ans =A

6. Create a script file by name condnal.m. The output of this program should be the truth table for conditional operator p→q. Write a code for the same.

Hint: Use the previous code. Change line 4 of the code suitably to get the required output.

output:

1 1 1

1 0 0

0 1 1

0 0 1

7. Create a script file by name biconditional.m. The output of this program should be the truth table for biconditional operator p↔q. (Hint : Modify the code in previous program suitably)

output:

1 1 1

1 0 0

0 1 0

0 0 1

8. Create a script file by name tautology.m. Type the following code in it. Input n as 2. This program checks if (p→q)↔(~pVq) is a tautology, contradiction or contingency. What is your output?

clear all;

n = input('Enter the number of propositions: ');

A= dec2bin(2^n-1:-1:0)-'0';

for i = 1 : (2^n)

if ( A(i, 1)==1 &A(i, 2)==0 );

A(i, 3)= 0;

else

A(i,3)=1;

end

A(i, 4)=~A(i, 1)|A(i, 2);

if (A(i,3)==A(i, 4))

A(i, 5)=1;

else

A(i, 5)=0;

end

end

ans=[A]

if A (1:2^n,5)==ones(2^n, 1)

fprintf('Tautology')

else

if A (1:2^n,5)==zeros(2^n, 1)

fprintf('contradiction')

else

fprintf('contingency')

end

end

9. Re-run the previous code with n=3. What is your output? Why?

10. Create a script file by name logequ.m. Type the following code in it.

This program checks if (p→q)^(p→r) is logically equivalent to p→(q^r).

clear all;

n = input('Enter the number of propositions: ');

A= dec2bin(2^n-1:-1:0)-'0';

for i =1 : 2^n

if A(i, 1)==1&A(i,2)==0

A(i, 4)=0;

else

A(i, 4)=1;

end

if A(i, 1)==1&A(i,3)==0

A(i,5)=0;

else

A(i,5)=1;

end

if A(i, 4)==1& A(i,5)==1

A(i,6)=1;

else

A(i,6)=0;

end

if A(i, 2)==1&A(i, 3)==1

A(i,7)=1;

else

A(i,7)=0;

end

if A(i, 1)==1&A(i,7)==0

A(i,8)=0;

else

A(i,8)=1;

end

end

ans=[A]

if A(1:2^n, 6)== A(1:2^n, 8)

fprintf('yes, , the propositions are equivalent')

else

fprintf('No, , the propositions are not equivalent')

end

(a)Input n as 2. What is the output. Why?

Answer : Index in position 2 exceeds array bounds. Index must not exceed 2.

Error in [**logequ**](matlab:matlab.internal.language.introspective.errorDocCallback('logequ',%20'/MATLAB%20Drive/logequ.m',%2010)) ([line 10](matlab:%20opentoline('/MATLAB%20Drive/logequ.m',10,0)))

if a(i, 1)==1&a(i,3)==0

We get this error because the number of variables n should be greater than or equal to 3, where as we have input n as 2 A(i,3) becomes meaningless in this case.

(b)Input n as 3.What is the output?

11. Use the above script file to check if (p→q)^(p→r) is logically equivalent to p→(qVr).

What is the output?

12. Write a program to check if [(pVq)^(p→r)^(q→r)]→r is a tauotology, contradiction or contingency.

13. Write a program to check the following logical equivalences:

(i) (p→q)→r ≡ p→(q→r) (ii)(p^q)→r ≡ (p→r)^(q→r) (iii) (p→q)→(r→s)≡(p→r)→(q→s)