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Q1) (16 points)

a. Use nodal analysis to find the value of i_x in the circuit below. 8

b. Write the Pspice (.cir) file needed to analyze the circuit below. 7

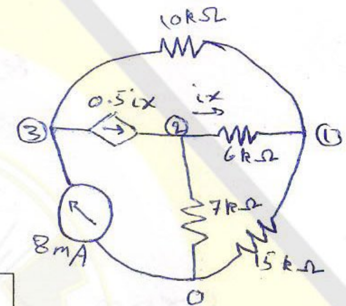
Hint:

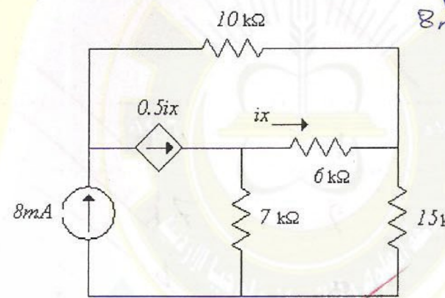
Voltage-controlled voltage source E

Current-controlled current source F

Voltage-controlled current source G

Current-controlled voltage source H





a. taking KCL leaving at:

* node ① : $\frac{V_1}{15000} + \frac{V_1 - V_3}{10000} - ix = 0$ — (A)

* node ② : $\frac{V_2}{7000} - 0.5ix + ix = 0$ — (B)

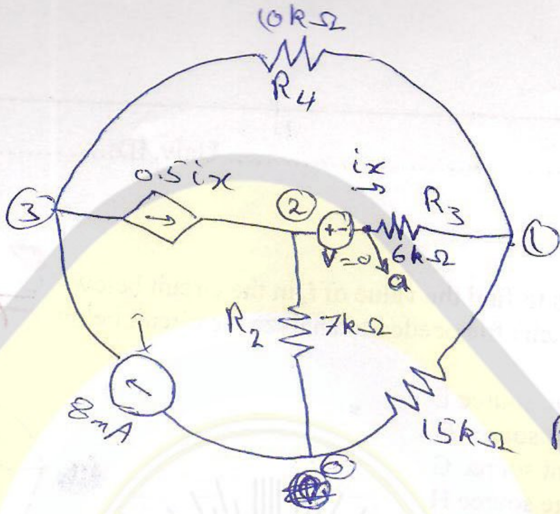
node ③ : $-0.008 + 0.5ix + \frac{V_3 - V_1}{10000} = 0$ — (C)

But: $ix = \frac{V_2 - V_1}{6000} \Rightarrow V_2 = 6000ix + V_1$

$\Rightarrow$ (B) $\Rightarrow \frac{6000ix}{7000} + \frac{V_1}{7000} - 0.5ix + ix = 0$

By solving the equations by calculator:

$\Rightarrow ix = -7.0588 \times 10^{-3}$ A



b.

exam

R1	0	1	15k	
R2	0	2	7k	
R3	1	a	6k	
R4	1	3	10k	
I	0	3	dc	8m
V	2	a	dc	0
Fx	3	2	V	0.5

-end

(-1)

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Q2) (8 points) Given $M = \begin{bmatrix} 1 & 4 & 2 & 4 \\ 7 & 5 & 9 & 2 \\ -5 & 7 & -2 & 0 \end{bmatrix}$, what is the result of executing the following MATLAB commands:

a. A = M(:,4:-2:2)
b. B = M (2:end,3)
c. C = M ([2,1], [3,1])
d. D = M; M(3,2) = 8

a. A = 4 4
2 5
0 7

b. B = 9
-2

c. C = 9 7
2 1

D = 1 4 2 4
7 5 9 2
-5 8 -2 0

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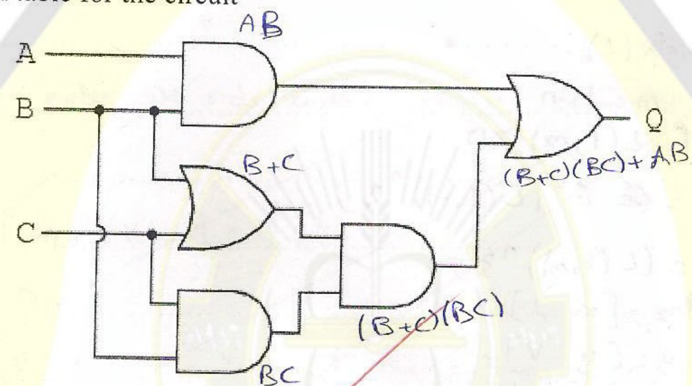
Q3) (8 points)

a. What is the logic function for the circuit shown

b. Generate the truth table for the circuit



a. $Q = (B+C)(BC) + AB$

b.

A	B	C	Q
0	0	0	0
1	0	0	0
0	1	0	0
1	1	0	1
0	0	1	0
1	0	1	0
0	1	1	1
1	1	1	1

```
x=[];
y=[];
L= input('enter the length');
       f2[A V]
function [A V] = f(L)
  n= length(L);
  for m=1:n
    if L(1,m)>0
    A = 6*(L(1,m))^2;
    V=(L(1,m))^3;
    x=[x A];
      y=[y V];
    else
    A=0;
    V=0;
    x=[x A];
    y=[y V];
    end
  end
                A = x
return          V = y
```

~~disp(x)~~

~~disp(y)~~

~~disp~~

~~[A V] = f(L)~~

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Q4) (8 points) Write a Matlab function that computes the *surface area*, and the *volume* of a cube, given its *side length* as an *input argument.* Your function should set the output arguments to 0 for a non-positive side length. Your function should work for a vector input argument correctly. Do not forget to include proper comments

```
L = input('enter the side length'); %request from user to enter the side length.
~~function~~
function [Area Volume] = f(L)
  if L>0
  Area = 6*L^2;   % find the surface area of the cube
  Volume = L^3;   % find the volume of the cube
  else
  Area = 0;
  Volume = 0;
  end
  return
~~disp('the surface area is', Area)~~
~~disp('the volume is', Volume)~~
~~[A V] = f(L)~~
[surefacearea volume] = f(L)
```