UNIVERSITY OF MANITOBA

DEPARTMENT:	Electrical & Computer Engineering	DATE & TIME:	16th December 2010 at 1800
COURSE NO:	ENG 1450	PAGE NO.:	1 of 1
COURSE TITLE:	Intro. Electrical & Computer Eng.	EXAMINATION:	Final (50%)
DURATION:	2 Hours	EXAMINERS:	C. Shafai/B. Kordi

INSTRUCTIONS:

- Do not remove the staple.
- Closed-book exam. No books/notes allowed.
- Electronic devices (such as calculators, PDAs, iPods, etc.) are NOT allowed.
- This is a multiple choice examination and consists of 30 questions.
- Mark your answer in pencil on the bubble sheet provided.
- Return both this booklet and the bubble sheet at the end of the examination.
- No marks will be given for working on this booklet.
- Each correct answer has one mark and each wrong answer has zero marks.
- No negative marks for wrong answer.
- A formula sheet is provided on the last page.

STUDENT NUMBER

PRINT YOUR NAME IN FULL ON THIS LINE

SIGNATURE

A01 (Prof. Shafai) A02 (Prof. Kordi)

CIRCLE YOUR SECTION

E2-229 EITC U College – Great Hall

CIRCLE EXAMINATION CENTRE

SEAT NUMBER

Mark	
Out of	30

1 Consider a resistive circuit with DC voltage/current sources. Which of the following is incorrect?

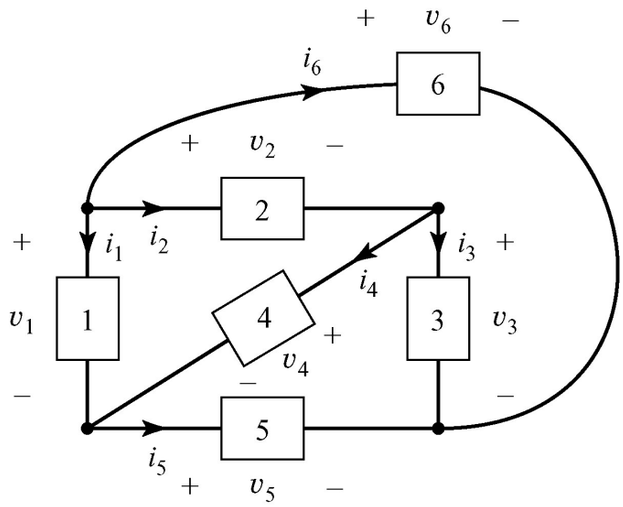
A) If the circuit has only one source, the source provides power.
B) If the circuit has only one source, the total power absorbed by all the resistors is equal to the power provided by the source.
C) If the circuit has two or more sources, there might be a source that absorbs power.
D) If the circuit has two or more sources, at least one of them provides power.
E) None of the above.

2 In a DC circuit (a circuit with DC sources only), there is a resistor in series with a capacitor. The circuit has been connected for a long time. Which of the following is incorrect?

A) The current of the resistor is zero.
B) The voltage of the resistor is zero.
C) The power absorbed by the resistor is zero.
D) The energy stored in the capacitor is equal to the energy absorbed by the resistor.
E) None of the above.

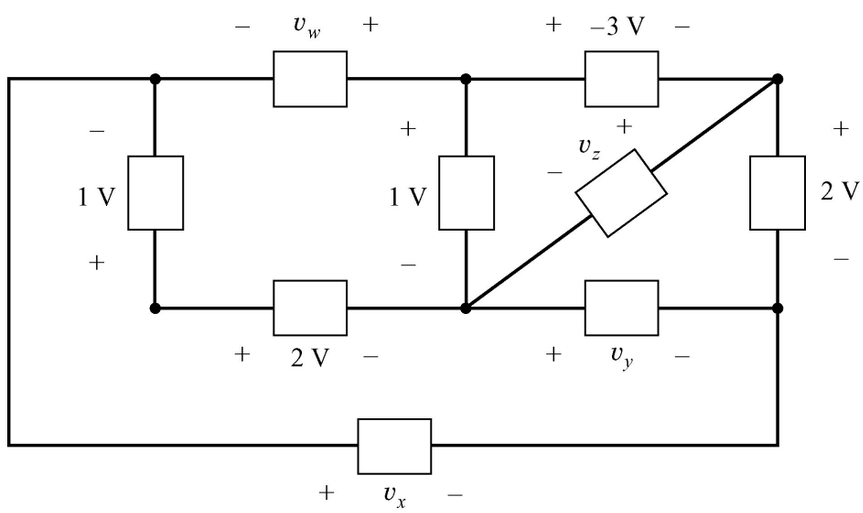
3 Which of the following is correct?

A) $i_1 + i_2 = i_6$
B) $i_1 + i_2 = 0$
C) $i_1 + i_2 = i_3 + i_5$
D) $i_1 + i_2 = i_4$
E) None of the above.



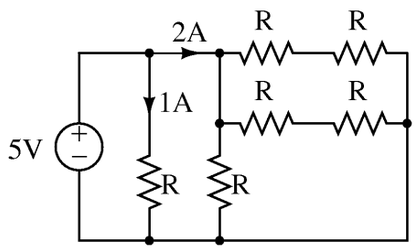
4 What is the value of $v_w + v_y$ in the circuit shown below?

A) 2 V
B) –2 V
C) 3 V
D) –3 V
E) 0 V



5 How much is the total power absorbed by all the resistors?

A) 5 W
B) 10 W
C) 15 W
D) 20 W
E) Not enough information is provided.

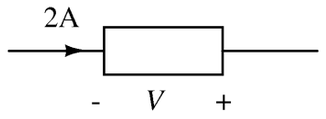


6 What is the value of R in Problem 5?

A) 5 Ω
B) 10 Ω
C) 15 Ω
D) 20 Ω
E) Not enough information is provided.

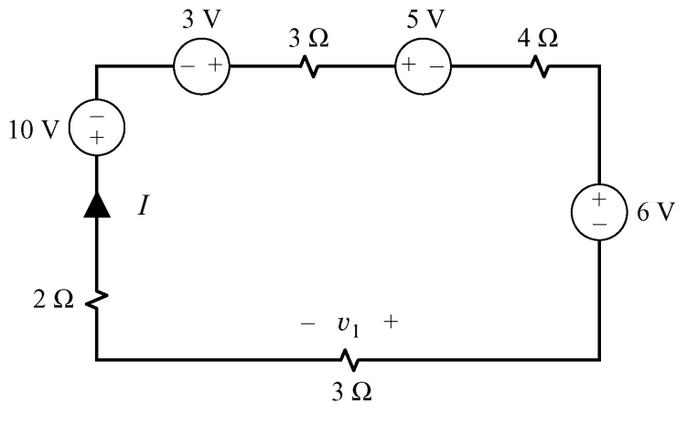
7 If the power of the component shown below is – 5 W, then the voltage V is equal to…

A) + 10 V
B) – 2.5 V
C) + 2.5 V
D) – 1.25 V
E) None of the above.



8 Which of the following is <u>correct</u> for the circuit shown below?

A) All four voltage sources deliver power.
B) The current of the loop, I, is 1.5 A.
C) The voltage v_1 is 4.5 V.
D) The power absorbed by any of the 3-Ω resistors 4.5 W.
E) None of the above.

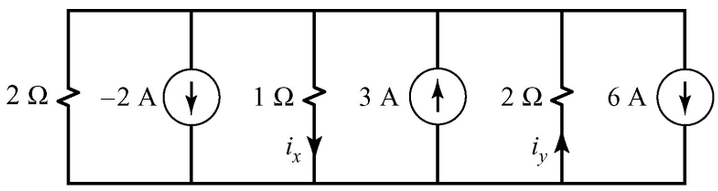


9 What is the power absorbed by the 4-Ω resistor in the circuit of Problem 8?

A) 0 W
B) 6 W
C) 8 W
D) 9 W
E) 16 W

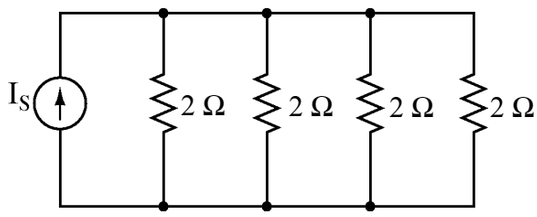
10 What are i_x and i_y, respectively?

A) + 0.5 A, + 0.25 A
B) + 0.5 A, – 0.25 A
C) – 0.5 A, + 0.25 A
D) – 0.5 A, – 0.25 A
E) None of the above.



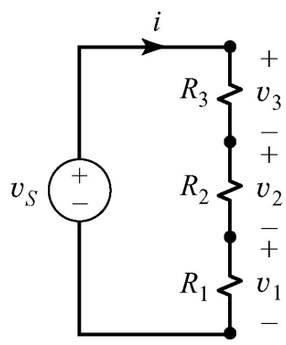
11 A current source is connected to four identical and parallel 2-Ω resistors, as shown below. If the power absorbed by <u>each</u> resistor is 2 W, how much is the value of the current source?

A) + 1 A
B) – 1 A
C) + 4 A
D) – 4 A
E) Both C and D.



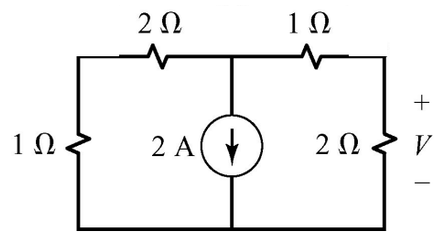
12 In the circuit given below, we have $v_1 = 2v_2 = 3v_3$ and $R_1 = 6\ \Omega$, then $R_1+R_2+R_3$ is equal to…

A) 18 Ω
B) 11 Ω
C) 36 Ω
D) 12 Ω
E) None of the above.



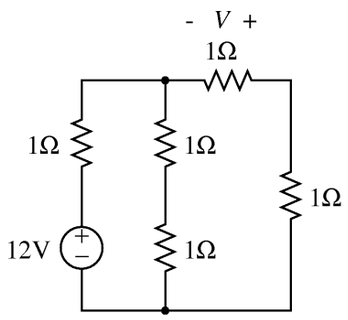
13 What is the voltage V in the circuit shown below?

A) – 4 V
B) + 4 V
C) – 2 V
D) + 2 V
E) None of the above.



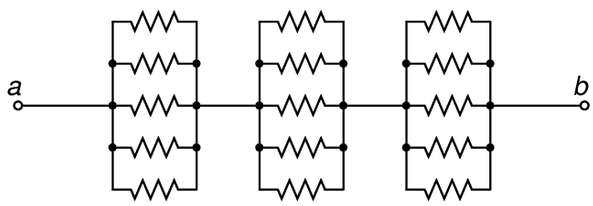
14 What is the voltage V in the circuit shown below?

A) -2.4 V
B) $+2.4$ V
C) -6 V
D) $+3$ V
E) -3 V



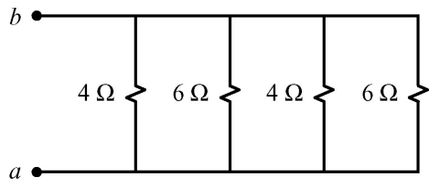
15 15 identical resistor are connected as shown below. If the equivalent resistance at terminals *ab* is 15 Ω, the value of each resistor is…

A) 25 Ω.
B) 9 Ω.
C) 1 Ω.
D) 10 Ω.
E) not an integer number.



16 In the circuit shown below, if each of the 4-Ω resistors is replaced by a 2-Ω resistor the equivalent resistance at terminals *ab*…

A) increases by 2/15 Ω.
B) decreases by 2/15 Ω.
C) increases by 9/20 Ω.
D) decreases by 9/20 Ω.
E) doesn't change.

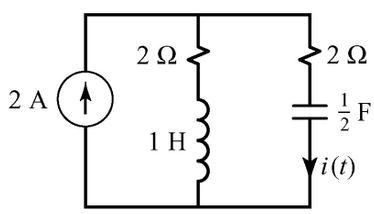


17 The equivalent capacitance of ten identical capacitors that are connected in parallel is 20 μF. If we connect them in series the equivalent resistance is equal to…

A) 2 μF.
B) 200 nF.
C) 20 nF.
D) 20 μF.
E) none of the above.

18 The circuit shown below has been connected for a long time. How much is the energy stored in the inductor?

A) 2 J
B) 4 J
C) 0 J



D) 1.5 J
E) None of the above.

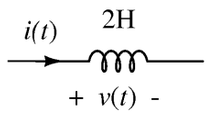
I

19 What is the impedance of a 10-nF capacitor at $\omega = 100$ rad/s?

A) $j\,10^{-6}\,\Omega$
B) $-j\,10^{6}\,\Omega$
C) $-j/(2\pi)$ MΩ
D) $-j500/\pi$ kΩ
E) None of the above

20 The current of a 2-H inductor is $i(t) = 5\sin(2t+30^\circ)$. What is the voltage of the inductor?

A) $v(t) = 10\sin(2t-60^\circ)$ V
B) $v(t) = 5\sin(2t+90^\circ)$ V
C) $v(t) = 10\sin(2t+120^\circ)$ V
D) $v(t) = 20\sin(2t+120^\circ)$ V
E) None of the above.



21 What is the binary representation of $(16DEC10)_{16}$?

A) 10110110111101100000010000
B) 10110110111101111000010000
C) 10100110111101100000010000
D) 10111110111101100000010000
E) 10110110111101100000110000

22 What is the minimum number of bits needed for the unsigned binary representation of $(511)_{10}$?

A) 7
B) 8
C) 9
D) 10
E) 11

23 The 6-bit binary representation of $(-23)_{10}$ using 1's complement is given by…

A) 010111
B) 110111
C) 101001
D) 101111
E) 101000

24 An 8-bit computer that uses 2's complement is used to evaluate $(-25)+(+23)$. Which of the following is calculated by the computer as the answer?

A) 00000010
B) 11111101
C) 01111110
D) 11111110

E) None of the above.

25 An 8-bit computer uses 2's complement to store negative numbers. The range of numbers that can be stored in this computer is…

A) from – 256 to +256
B) from – 127 to +127
C) from – 255 to +256
D) from – 128 to +127
E) none of the above.

26 Which of the following does show the truth table for $z=x'+y$?

A)

x	y	z
0	0	0
0	1	1
1	0	1
1	1	1

B)

x	y	z
0	0	1
0	1	0
1	0	0
1	1	1

C)

x	y	z
0	0	1
0	1	0
1	0	0
1	1	0

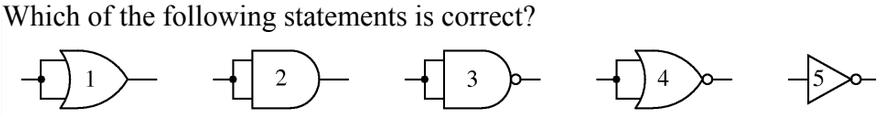
D)

x	y	z
0	0	0
0	1	0
1	0	0
1	1	1

E)

x	y	z
0	0	1
0	1	1
1	0	0
1	1	1

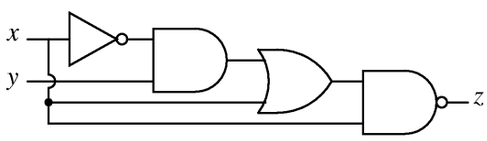
27 Which of the following statements is correct?



A) Digital circuits 1 and 4 are equivalent.
B) Digital circuits 2 and 3 are equivalent.
C) Digital circuits 3 and 5 are equivalent.
D) Digital circuits 1 and 5 are equivalent.
E) Digital circuits 2 and 5 are equivalent.

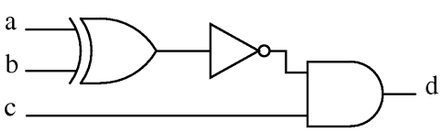
28 Which of the following describes the following digital circuit?

A) $z=x'\cdot y+x\cdot x'$
B) $z=(x'\cdot y+x\cdot x)'$
C) $z=(x'\cdot y+x)\cdot x'$
D) $z=[(x'\cdot y+x)\cdot x]'$
E) None of the above.



29 Which of the following is correct for the circuit shown below?

A) If a=b=c=0, then d=1.
B) If a=b=c=1, then d=0.
C) If a=b=0 and c=1, then d=1.
D) If a=1 and b=c=0, then d=1.
E) None of the above.



30 The digital variables *x* and *y* show if the two front doors of a car are open or not (0: open, 1: closed). The output of a digital circuit, *z*, controls a light (0: off, 1:on). The circuit must turn the light on when either of (but not both) doors are open. Which of the following does describe the operation of this circuit?

A)

x	*y*	*z*
0	0	0
0	1	1
1	0	1
1	1	1

B)

x	*y*	*z*
0	0	1
0	1	0
1	0	0
1	1	1

C)

x	*y*	*z*
0	0	1
0	1	0
1	0	0
1	1	0

D)

x	*y*	*z*
0	0	0
0	1	1
1	0	1
1	1	0

E)

x	y	z
0	0	1
0	1	1
1	0	1
1	1	0

Formula Sheet

Ohm's law: $V = RI$

Power: $P = VI$

Voltage division: $V_k = \frac{R_k}{\sum R_i} V_S$

Current division: $I_k = \frac{\frac{1}{R_k}}{\sum \frac{1}{R_i}} I_S$

Resistors in series: $R_{eq} = \sum R_i$

Resistors in parallel: $\frac{1}{R_{eq}} = \sum \frac{1}{R_i}$

Capacitors in series: $\frac{1}{C_{eq}} = \sum \frac{1}{C_i}$

Capacitors in parallel: $C_{eq} = \sum C_i$

Inductors in series: $L_{eq} = \sum L_i$

Inductors in parallel: $\frac{1}{L_{eq}} = \sum \frac{1}{L_i}$

Energy stored in a capacitor: $W = \frac{1}{2} CV^2$

Energy stored in an inductor: $W = \frac{1}{2} LI^2$

Impedance of a capacitor: $Z_C = \frac{1}{j\omega C}$, where $\omega = 2\pi f$

Impedance of an inductor: $Z_L = j\omega L$, where $\omega = 2\pi f$

α	0°	30°	45°	60°	90°	120°	135°	150°	180°

$\sin\alpha$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
$\cos\alpha$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0	$-\frac{1}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{\sqrt{3}}{2}$	-1
$\tan\alpha$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	∞	$-\sqrt{3}$	-1	$-\frac{\sqrt{3}}{3}$	0