UNIVERSITY OF MANITOBA

DEPARTMENT:	Electrical & Computer Engineering	DATE & TIME:	21st April 2011 at 09:00
COURSE NO:	ENG 1450	PAGE NO.:	1 of 9
COURSE TITLE:	Intro. Electrical & Computer Eng.	EXAMINATION:	Final (50%)
DURATION:	2 Hours	EXAMINERS:	A.M. Gole/A. Major

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. Gole) A02 (Prof. Major)

CIRCLE YOUR SECTION

FR Kennedy Brown Gym

CIRCLE EXAMINATION CENTRE

SEAT NUMBER

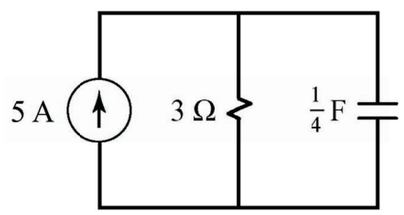
Mark	
Out of	30

1 Consider a circuit consisting of one -10 V dc voltage source connected to a network of 5 resistors. Which of the following is correct?

A) The source absorbs power because it has a negative voltage.
B) There is at least one resistor that generates power (i.e. absorbs *negative* power).
C) The sum of the powers absorbed by the 5 resistors equals the power delivered by the source.
D) All of the above.
E) None of the above.

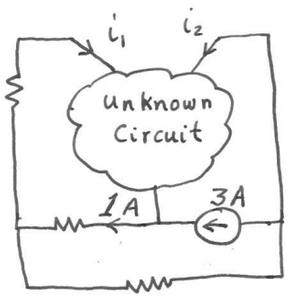
2 A DC circuit shown below has been connected for a long time. Which of the following is incorrect?

A) The capacitor does not store any energy.
B) The voltage of the resistor is not equal to zero.
C) The power is absorbed by the resistor.
D) The current of the resistor is not equal to zero.
E) None of the above.



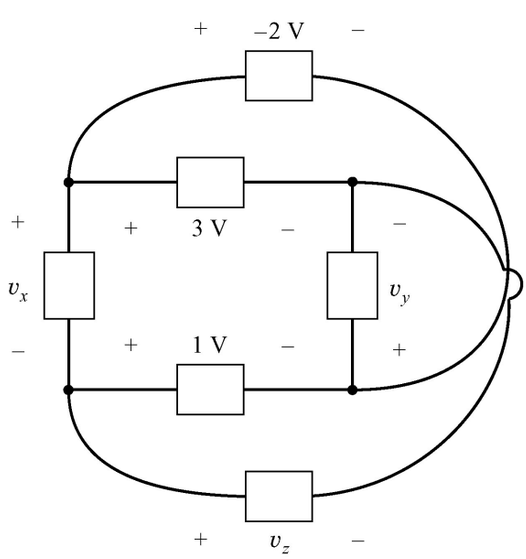
3 Which of the following is correct?

A) $i_1 + i_2 = -3\ A$
B) $i_1 + i_2 = 0$ A
C) $i_1 + i_2 = 2\ A$
D) $i_1 + i_2 = -2A$
E) None of the above.

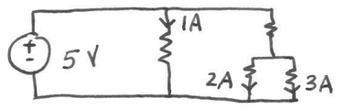


4 What is the value of $v_x + v_z$ in the circuit shown below?

A) +2 V
B) – 2 V
C) +3 V
D) – 3 V
E) 0 V

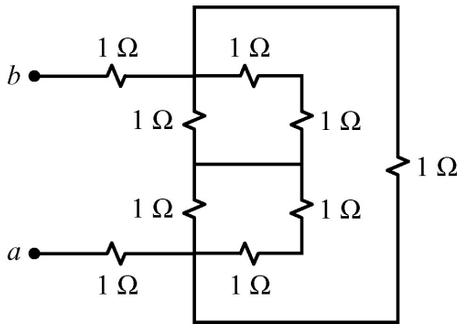


5 The total power delivered by the 5 V source is:



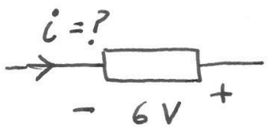
A) 5 W
B) 30 W
C) 15 W
D) 10 W
E) Not enough information is provided.

6 What is the equivalent resistance at terminals *ab*?



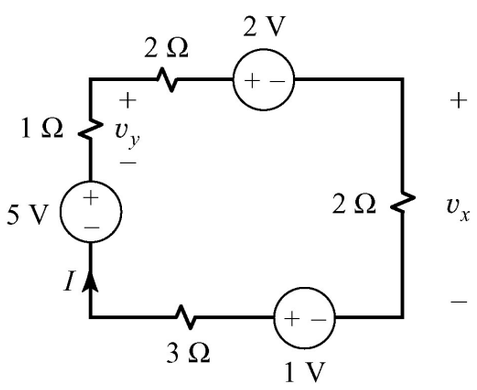
A) 18/7 Ω
B) 3.5 Ω
C) 3/4 Ω
D) 20/11 Ω
E) 2 Ω

7 If the power ***into*** the component shown below is 12 W, then the current i *is:*



A) +2 A
B) – 2.5 A
C) +4 A
D) – 12 A
E) – 2 A

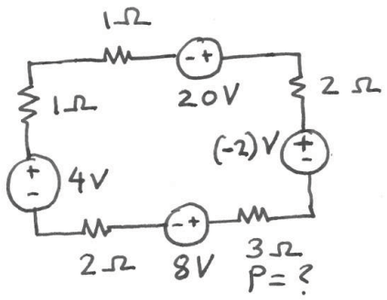
8 Which of the following is <u>correct</u> for the circuit shown below?



A) The power absorbed by any of the 2-Ω resistors is 0.5 W
B) The current *I*, as shown, is – 0.5 A.
C) The voltage v_x is +4.5 V.
D) All three voltage sources deliver power.
E) None of the above.

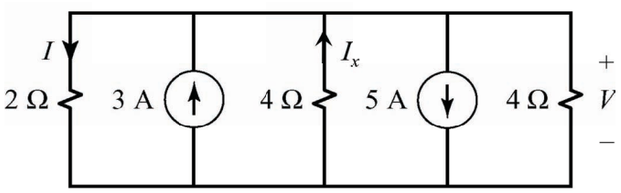
9 What is the power absorbed by the 3-Ω resistor in the circuit shown below?

A) 0 W
B) 6 W
C) 9 W
D) 12 W
E) 18 W



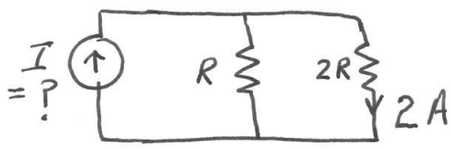
10 What are I and I_x, respectively?

A) + 1 A, + 0.5 A
B) + 1 A, – 2 A
C) – 1 A, + 0.5 A
D) – 0.5 A, – 0.25 A
E) None of the above.



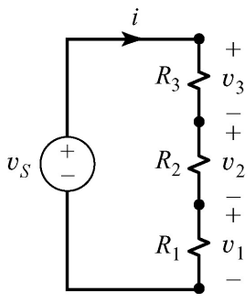
11 The resistors in the circuit below have values R and 2R as shown below, where R is not given. The value of the current source I is:

A) + 6 A
B) – 5 A
C) + 4 A
D) – 4 A
E) None of the above.



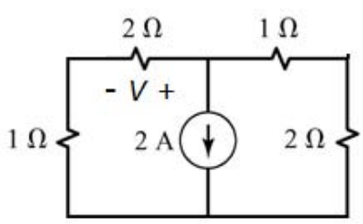
12 In the circuit given below P_i is the power absorbed by the resistor R_i. It is given that $P_3 = 2P_2 = 3P_1$. If $R_1 = 6\ \Omega$, then R_2 is equal to…

A) 12 Ω
B) 9 Ω
C) 18 Ω
D) 24 Ω
E) None of the above.



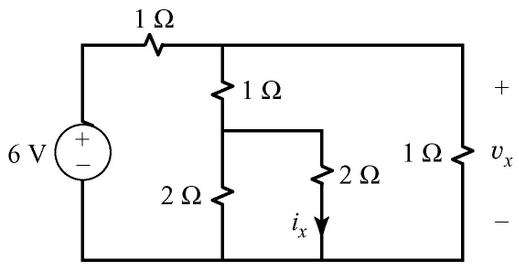
13 What is the voltage V across the 2 Ω resistor in the circuit shown below?

A) – 3 V
B) + 4 V
C) – 2 V
D) + 2 V
E) None of the above.



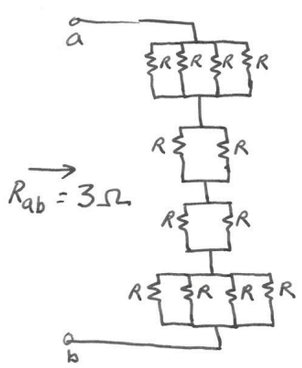
14 What is the voltage v_x in the circuit shown below?

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



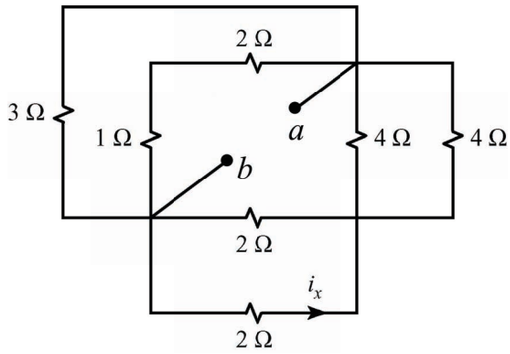
15 All resistors in the circuit shown below are indentical and have a value *R*. If the equivalent resistance at terminals ***ab*** is 3 Ω, the value of each resistor *R* is…

A) 25 Ω
B) 9 Ω
C) 1 Ω
D) 3 Ω
E) 2 Ω



16 What is the equivalent resistance between terminals *ab* in the circuit shown below?

A) 8 Ω
B) 2 Ω
C) 6 Ω
D) 1 Ω
E) None of the above.

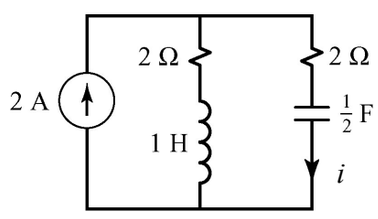


17 Three identical capacitors are connected in *series,* resulting in an equivalent capacitance of *1* µF. If the same three capacitors are now connected in *parallel* their equivalent capacitance becomes:

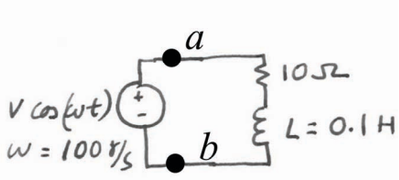
A) 3 µF.
B) 9 µF.
C) 6 µF.
D) 20 µF.
E) -4 µF.

18 The circuit shown below has been connected for a long time. What is the energy stored in the capacitor?

A) 2 J
B) 0 J
C) 4 J
D) 1.5 J
E) None of the above.

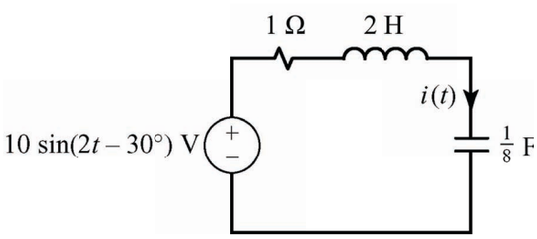


19 Assume a source frequency $\omega = 100$ rad/s. The equivalent impedance Z_{ab} seen by the source (between terminals a and b) is:



A) $(10\sqrt{2})\angle(45°)\,\Omega$
B) $(10 - j0.1)\,\Omega$
C) $-j0.1\ \Omega$
D) $j10\ \Omega$
E) None of the above

20 The current $i(t)$ in the circuit shown below is:



A) $i(t) = 5\sin(2t - 60°)$ A
B) $i(t) = 10\sin(2t - 30°)$ A
C) $i(t) = 5\sin(2t + 120°)$ A
D) $i(t) = 20\sin(2t + 120°)$ A
E) None of the above.

21 What is the binary representation of $(ABC1)_{16}$?

A) 1011011011110110
B) 0101010110100001
C) 0001101010011001
D) 1010101111000001
E) 1011010010000001

22 What is the 2's complement binary representation of $(85)_{10}$ using 8 bits?

A) 00011101
B) 10101010
C) 01010101
D) 10111011
E) 11011100

23 The 6-bit binary representation of $(-25)_{10}$ using 2's complement is given by…

A) 100111
B) 100110
C) 011010
D) 101111
E) 011001

24 An 8-bit computer that uses 2's complement is used to evaluate $(-35) + (+23)$. Which of the following is calculated by the computer as the answer?

A) 00001100
B) 11110101
C) 01111110
D) 11110100

E) None of the above.

25 The largest *unsigned* number that can be represented using a 7 bit representation is:

A) 16
B) 127
C) 63
D) 129
E) 255

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

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

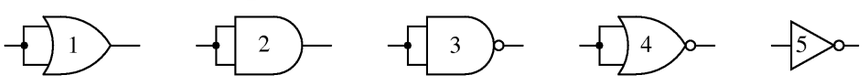
D)

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

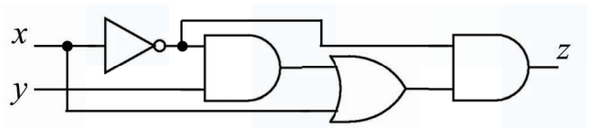
27 Which of the following statements is correct?



A) Digital circuits 1 and 4 are equivalent (i.e., provide the same output given the same input).
B) Digital circuits 2 and 3 are equivalent.
C) Digital circuits 1 and 2 are equivalent.
D) Digital circuits 1 and 5 are equivalent.
E) Digital circuits 2 and 5 are equivalent.

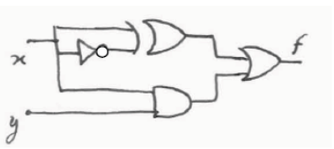
28 Which of the following describes the following digital circuit?

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 statements is ***false*** for the circuit shown below?

A) If x=0 and y=0, then f=1
B) If x=0 and y=1, then f =1
C) If x=1 and y=0, then f=1
D) If x=1 and y=1, then f=1
E) If x=1 and y = 1, then f=0



30 A simple combination lock is to be designed. The user selects a number between 0 and 7 by operating three binary switches *a, b* and *c*. For example, if the user presses *a*=0, *b*=0, *c*=0; it means "000" or that the user has keyed in the number "0" ; and if *a*=1, *b*=1, *c*=0 are pressed, it means "110" or the number "6" has been keyed in, and so on. The lock opens if and only if the user keys in either a "2" or a "5". Select the correct logical function to implement the "lock open" command " L " (i.e. L = 1 means "open the lock").

A) $L = a + b'c'a$
B) $L = a'b'c' + abc + abc'$
C) $L = ab + c'd$
D) $L = a'bc' + ab'c$
E) $L = ac$

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