

BITS, PILANI – DUBAI CAMPUS, KNOWLEDGE VILLAGE, DUBAI
FIRST SEMESTER 2006 – 2007
ES UC 241 ELECTRICAL SCIENCES – I
QUIZ 2 (CLOSED BOOK)

MAXIMUM MARKS: 10

DATE: 01.11.06

SET 1

WEIGHTAGE: 10 %
DURATION: 30 MINUTES

Tick (✓) ONLY ONE option; Overwritten answer will NOT be evaluated.

NAME:

Id. No.:

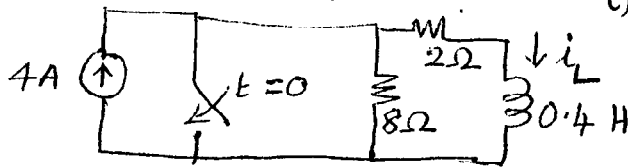
1. The inductor current i_L for $t > 0$ is

a) 2.8 A

b) 0.8 A

c) 3.2 A

d) 2.2 A



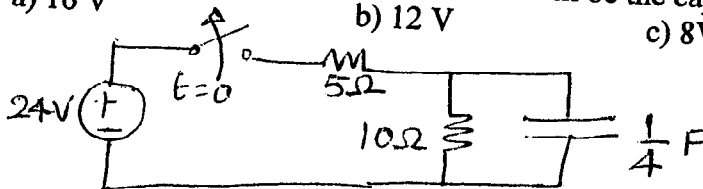
2. If the switch is opened at $t=0$, what will be the capacitor voltage for $t > 0$

a) 16 V

b) 12 V

c) 8 V

d) 20 V



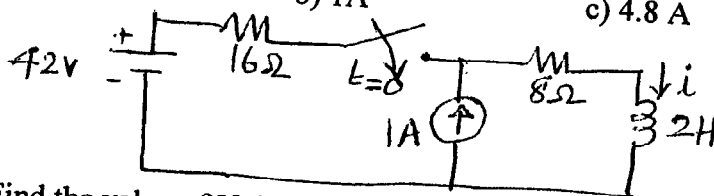
3. If the switch is closed at $t=0$, what will be the inductor current i for $t > 0$

a) 0 A

b) 1 A

c) 4.8 A

d) 5.25 A



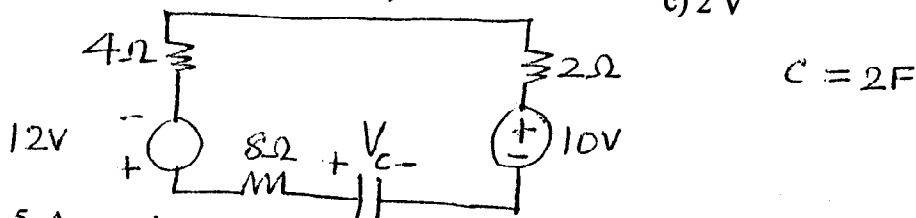
4. Find the value of V_c in the circuit of the following figure in steady state

a) 12 V

b) -2 V

c) 2 V

d) 22 V



5. A capacitor is charged with 8mC. If the energy stored is 0.4J what is the value of capacitance?

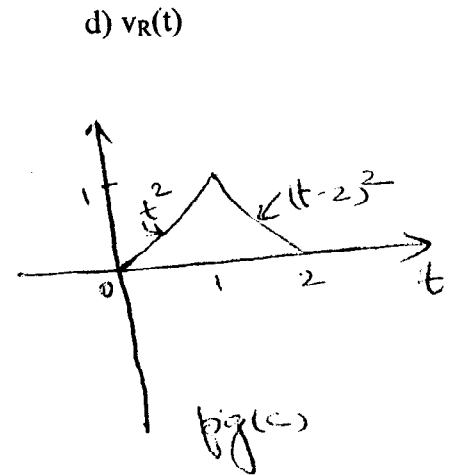
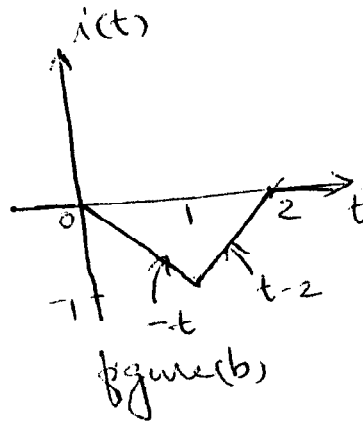
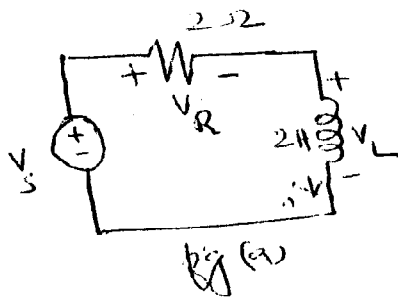
a) 80 F

b) 80 μ F

c) 0.8 F

d) 0.8 μ F

6. For the circuit shown in figure (a), $i(t)$ is described by the function given in figure (b). Then figure (c) corresponds to



a) $w_L(t)$

b) $v(t)$

c) $p_R(t)$

d) $v_R(t)$

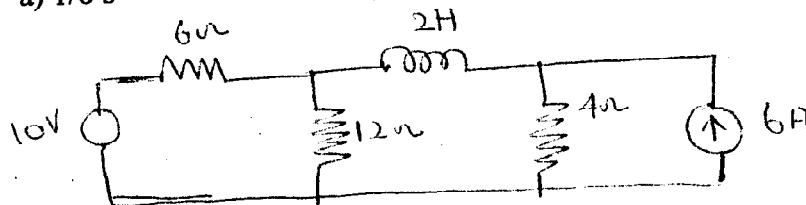
7. Find the time constant of the circuit.

a) $1/8$ s

b) 4s

c) $1/4$ s

d) 8 s



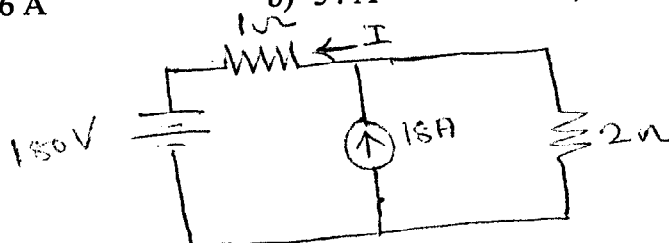
8. Apply superposition theorem to find I .

a) -66 A

b) -54 A

c) 54 A

d) 66A



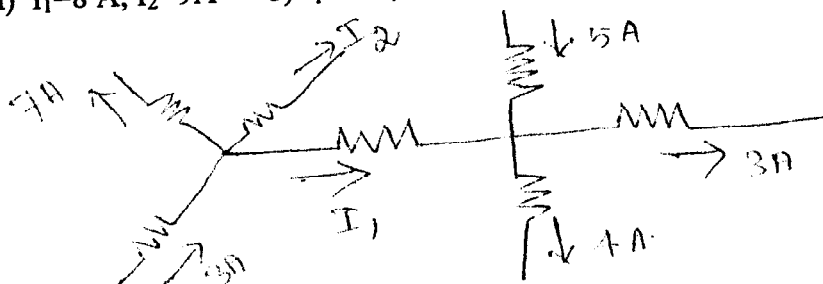
9. Find I_1 and I_2 in the circuit?

a) $I_1=8$ A, $I_2=9$ A

b) $I_1=2$ A, $I_2=6$ A

c) $I_1=-2$ A, $I_2=6$ A

d) $I_1=2$ A, $I_2=-6$ A



10. A 620V source connected to a resistor network described by $R_T=50\Omega + R$ in parallel with 20Ω provides 120V to the 20Ω resistor. What is R ?

a) 60Ω

b) 30Ω

c) 15Ω

d) 10Ω

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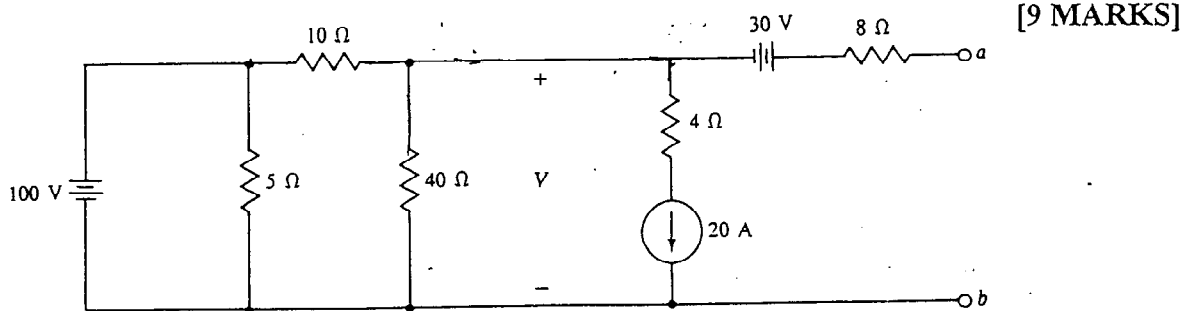
ES UC 241 ELECTRICAL SCIENCES – I
COMPREHENSIVE EXAMINATION (CLOSED BOOK)

MAXIMUM MARKS: 80
DATE: 25.12.06

WEIGHTAGE: 40%
DURATION: 3 HOURS

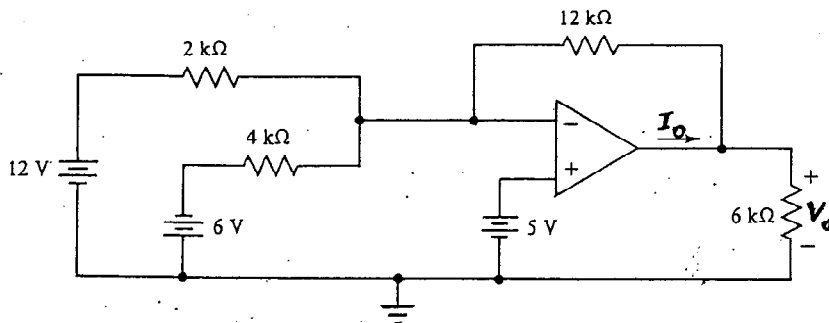
Write Part A, B and C in separate sheets. Part A

1. Use super position theorem to find V_{ab} with reference positive on terminal a.



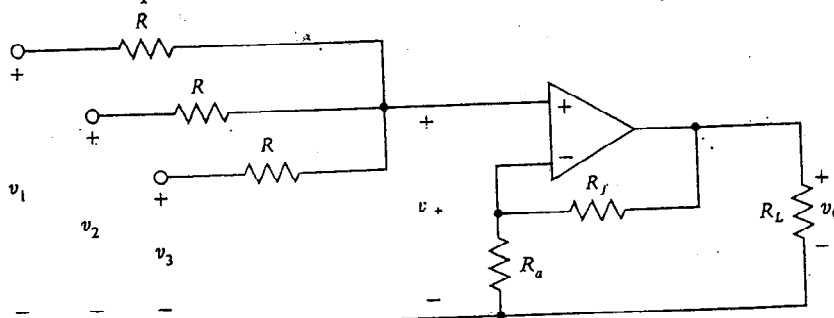
- 2A. Calculate V_o and I_o in the circuit.

[5 MARKS]



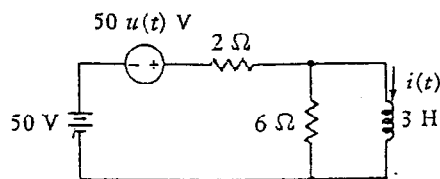
- 2B. Write the expression for V_o in the circuit and identify the circuit.

[4 MARKS]



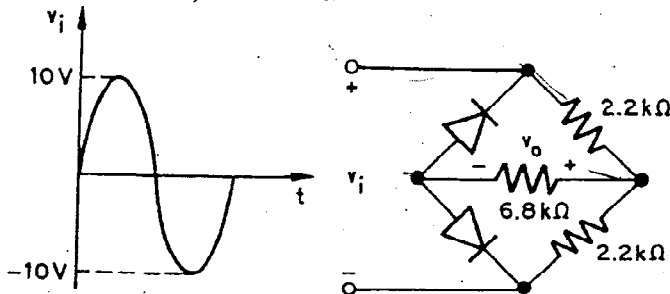
3. Determine $i(t)$ for all values of time in the circuit of given figure and sketch the complete response for $i(t)$

[9 MARKS]

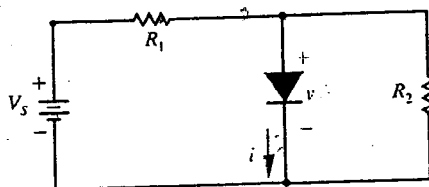


Part B

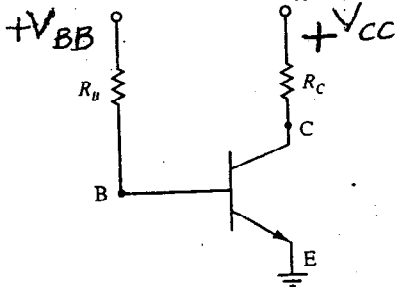
4A. For the circuit shown below, sketch V_o . Assume the diodes to be ideal. [6 MARKS]



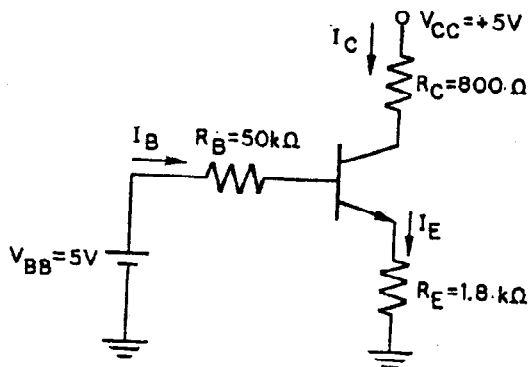
4B. For the diode circuit shown below, $V_s = 2V$ and the silicon diode has a saturation current of $1nA$ at $300 K$. Given that $v = 0.7 V$, find R_2 when $R_1 = 1 k\Omega$. [4 MARKS]



5. The circuit shown under has $V_{BB} = V_{CC} = 10 V$. Assuming the transistor has $\beta = 100$, find (a) the maximum value of R_C for active-region operation when $R_B = 300 k\Omega$ and (b) the minimum value of R_B for active-region operation when $R_C = 2 k\Omega$. [9 MARKS]

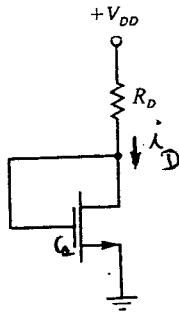


6. Show that the transistor shown below is operating in active mode. Given $\beta = 50$, calculate i_C , i_B and i_E [8 MARKS]



PART C

7. For the MOSFET circuit given in figure, replace the short circuit that is connected between the gate and the drain with a $1\text{M}\Omega$ resistor. In addition place another $1\text{-M}\Omega$ resistor between the gate and the reference. Given that $K = 0.25\text{mA/V}^2$, $V_t = 2\text{V}$, $R_D = 500\Omega$, and $V_{DD} = 12\text{V}$, find (a) the ^{active} region of operation for the MOSFET, (b) v_{GS} (c) v_{DS} and (d) i_D [9 marks]

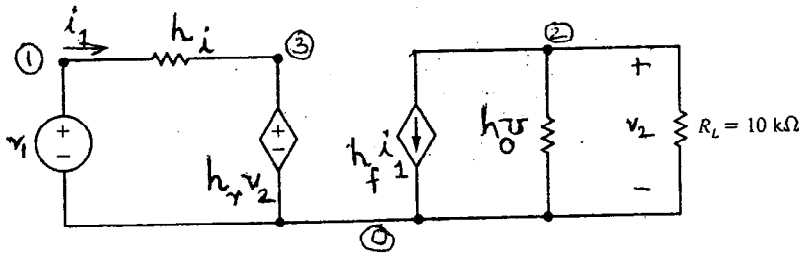


8. (a) Use algebraic manipulations to express the Boolean function $F = \bar{A}\bar{B} + B\bar{C}$ as a product of maxterms. Show all steps and indicate the law (rule) used for each step [4 marks]

8. (b) Construct a truth table for the function $F_1 = A \uparrow (B \uparrow C)$, where \uparrow denotes the NAND operation. Express F_1 (i) as sum of minterms [7 marks]

9. Write an input file to find i_1 and v_2 for the circuit shown in figure. $h_i = 1\text{ k}\Omega$, $h_r = 2.5 \times 10^{-4}$, $h_f = 50$, $h_o = 25\mu\text{S}$, $R_L = 10\text{ k}\Omega$, and $v_1 = 1\text{V}$

[6 marks]

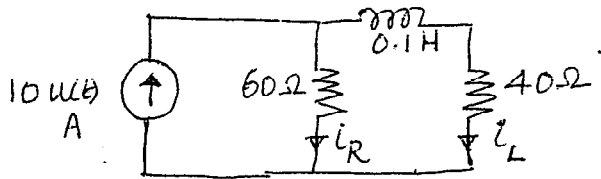


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 ES UC 241 ELECTRICAL SCIENCES – I
 TEST 2 (OPEN BOOK)

MAXIMUM MARKS: 20
 DATE: 12.11.06

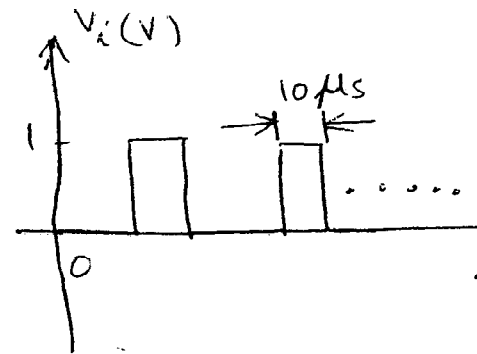
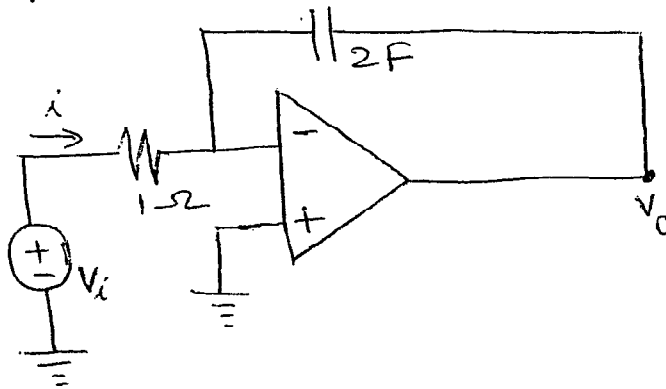
WEIGHTAGE: 20%
 DURATION: 50 MINUTES

1. For the circuit shown, find i_R and i_L at a) $t < 0$;
 b) $t > 0$; c) $t = \infty$; d) $t = 1.5 \text{ ms}$



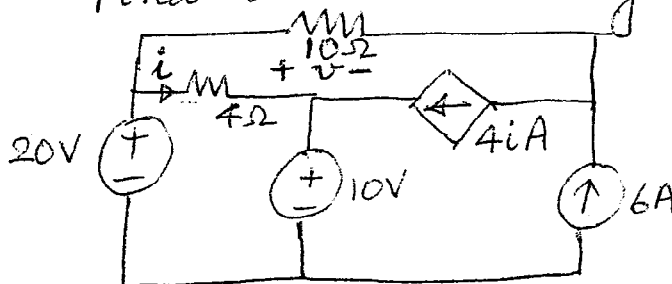
[7 MARKS]

2. For the circuit shown, sketch and label the output waveform resulting. How many pulses are required for an output voltage change of 1V ?



[6 MARKS]

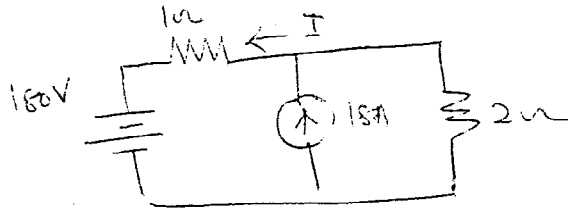
3. Find i and v using superposition theorem.



[7 MARKS]

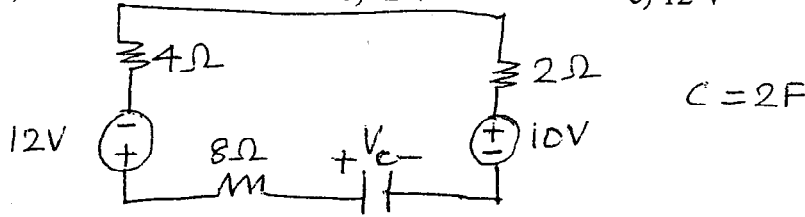
6. Apply superposition theorem to find I.

- a) 66 A b) 54 A c) -54 A d) -66A



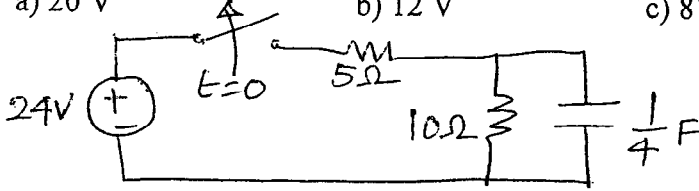
7. Find the value of V_c in the circuit of the following figure in steady state

- a) 2 V b) -2 V c) 12 V d) 22 V



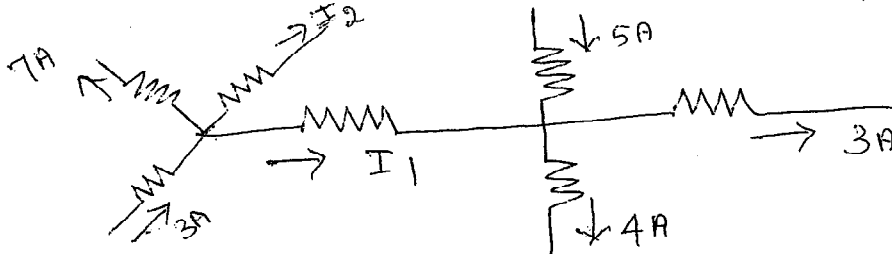
8. If the switch is opened at $t=0$, what will be the capacitor voltage for $t > 0$

- a) 20 V b) 12 V c) 8 V d) 16 V



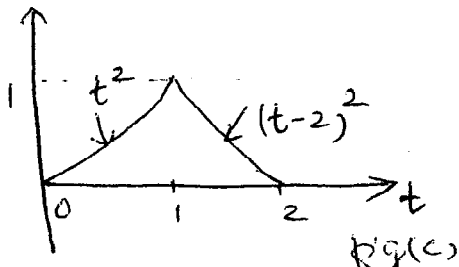
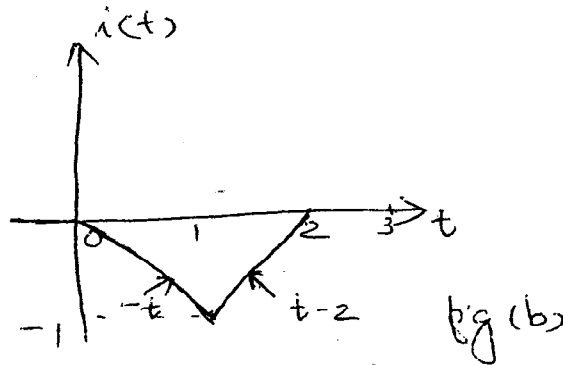
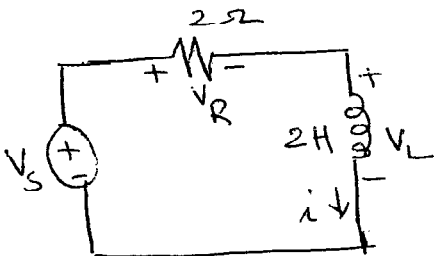
9. Find I_1 and I_2 in the circuit?

- a) $I_1=8\text{ A}, I_2=9\text{ A}$ b) $I_1=-2\text{ A}, I_2=6\text{ A}$ c) $I_1=2\text{ A}, I_2=6\text{ A}$ d) $I_1=2\text{ A}, I_2=-6\text{ A}$



10. For the circuit shown in figure (a), $i(t)$ is described by the function given in figure (b). Then figure (c) corresponds to

- a) $p_R(t)$ b) $v_R(t)$ c) $w_L(t)$ d) $v(t)$



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QUIZ 1 (CLOSED BOOK) (MAKE-UP)

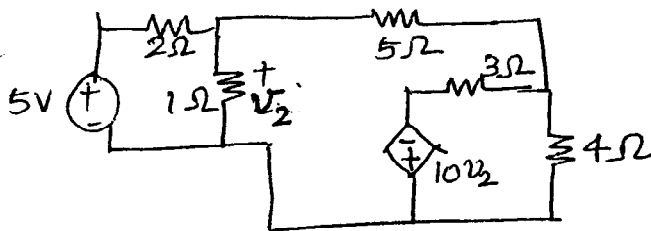
MAXIMUM MARKS: 10
 DATE:

SET 2

WEIGHTAGE: 10 %
 DURATION: 30 MINUTES

① The equation written for mesh 2 is

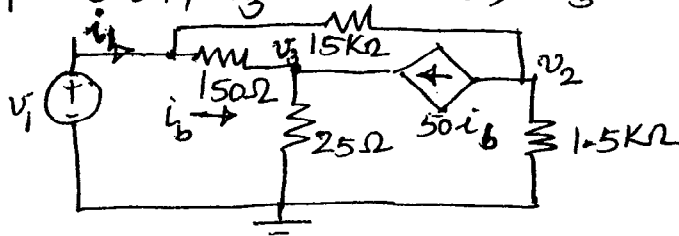
- A) $-5i_1 + 19i_2 - 2i_3 = 0$
 B) $-5i_1 + 19i_2 - 5i_3 = 0$
 C) $-5i_1 + 19i_2 = 10$
 D) $-11i_1 + 19i_2 - 3i_3 = 0$



Q.No	ANS
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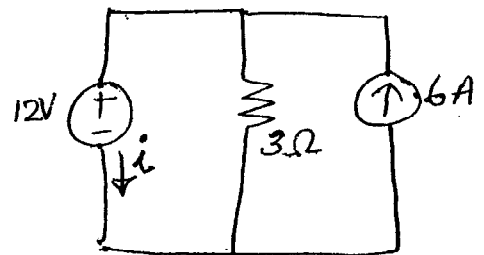
② The KCL equation at node v_3 is

- A) $v_1 = 0.894 v_3$ B) $v_3 = 0.894 v_1$
 C) $v_1 = -0.894 v_3$ D) $v_3 = 1.28 v_1$



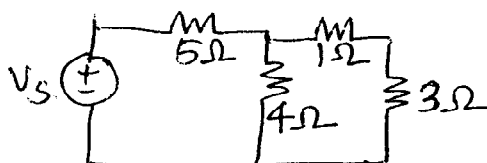
③ Find i in the figure

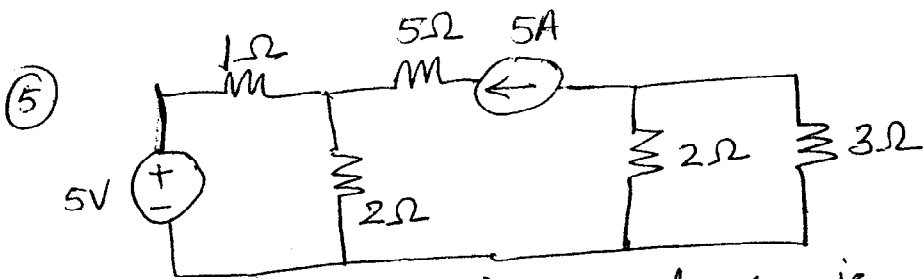
- A) -6A B) -4A
 C) 2A d) 4A



④ The resistance seen across terminals a and b is

- A) 13Ω b) 0.56Ω C) 5.63Ω D) 7Ω



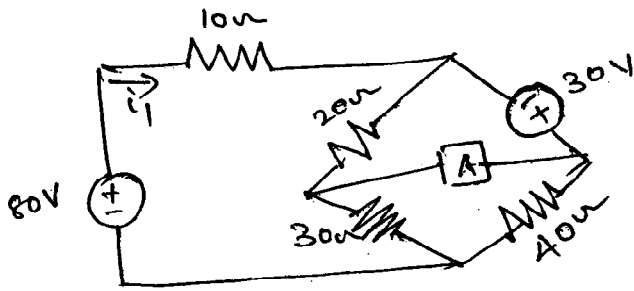


The current in mesh 1 is

- A) -2.66 A B) -1.66 A
 C) -2.06 A D) -0.66 A

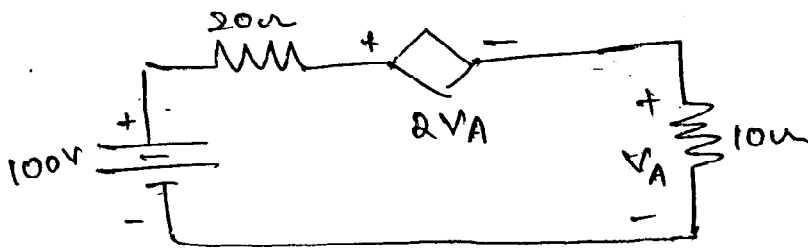
⑥ Use mesh analysis to find i_1 if element A is an open circuit.

- A) 5 A B) 1.96 A C) -3 A D) 3 A .

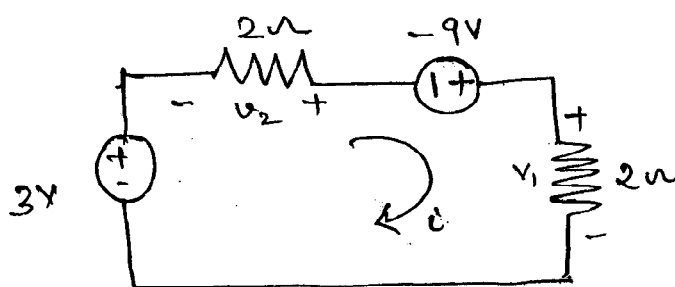


⑦ Power absorbed by the dependent source.

- A) 80 W B) 40 W C) 20 W D) 10 W .

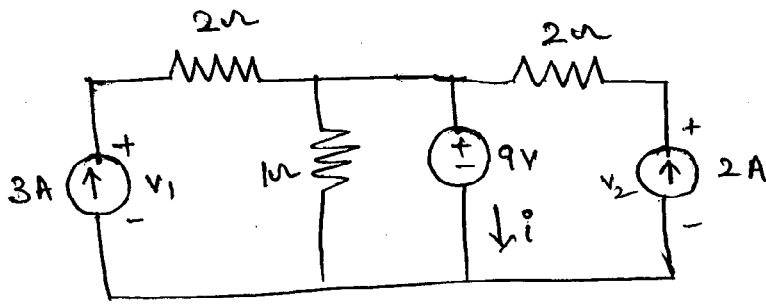


⑧ Find the v'ables indicated. (V_1 , V_2 and i)



- A) -3 3 $-2/3$
 B) -3 3 $-3/2$
 C) 0 3 $2/3$
 D) -3 0 $-2/3$

9) Find the variables indicated v_1 , v_2 and i .



- A) 18V, 13V, -4A
- B) 13V, 15V, 4A
- C) 13V, 18V, 4A
- D) 15V, 13V, -4A

10) The potential difference applied to a $1k\Omega$ resistance is in order that a current of $100\mu A$ may flow is

- a) 1V
- b) 100V
- c) 0.1V
- d) 10V

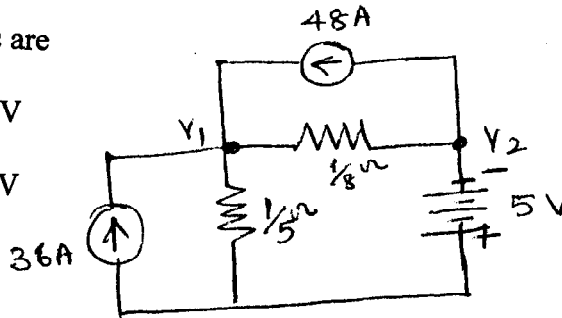
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FIRST SEMESTER 2006 – 2007
ES UC 241 ELECTRICAL SCIENCES – I
QUIZ 1 (CLOSED BOOK)

MAXIMUM MARKS: 10
DATE: 20.09.06

SET 2

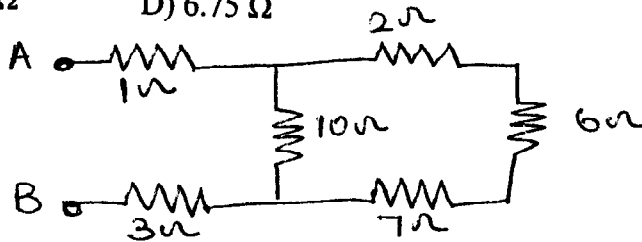
WEIGHTAGE: 10 %
DURATION: 30 MINUTES

1. The node voltages are
 A) 5 V, 8.5 V
 B) -5 V, 3.35 V
 C) 8.5 V, 5 V
 D) 3.38 V, -5 V



Q. No	ANS
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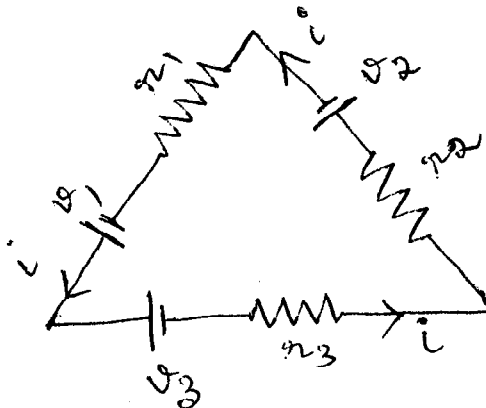
2. The equivalent resistance as seen from the terminals AB is
 A) 10 Ω B) 7.24 Ω
 C) 10.95 Ω D) 6.75 Ω



3. When two resistors are connected in parallel
 A) the voltage across each element must be the same
 B) the current through each must be the same
 C) their combined resistance equals the sum of the individual values
 D) each must have the same resistance value
4. A 90A current flows into two parallel resistors having resistances of 12 Ω and 24 Ω . The current in the 24 Ω resistor is
 A) 40 A B) 60 A C) 80 A D) 30 A

5. The KVL equation for the circuit given is

- A) $v_1 + v_2 + v_3 = ir_1 + ir_2 + ir_3$
 B) $-v_1 + v_2 + v_3 - ir_1 - ir_2 - ir_3 = 0$
 C) $-v_1 + v_2 + v_3 = ir_1 - ir_2 + ir_3$
 D) $v_1 - v_2 - v_3 = ir_1 + ir_2 + ir_3$



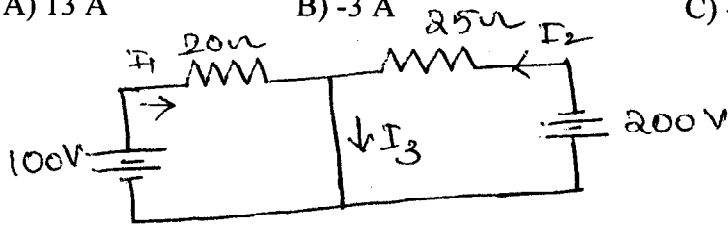
6. Find i_3 in the given figure

A) 13 A

B) -3 A

C) -13 A

D) 3 A



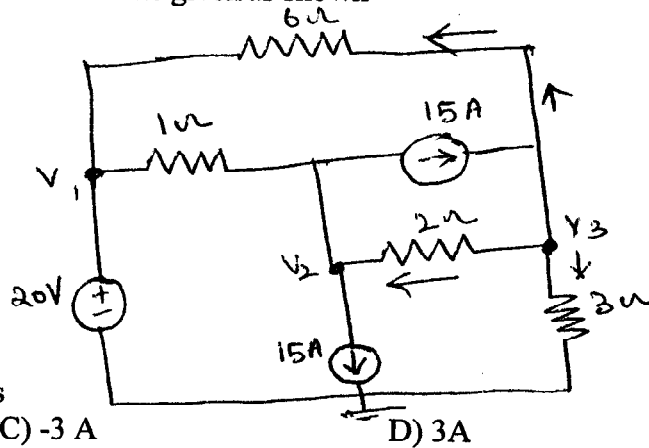
7. The nodal equation at the node v_3 for the currents given as shown

A) $3v_2 - v_3 = 90$

B) $-3v_2 + 4v_3 = 15$

C) $-3v_2 + 6v_3 = 110$

D) $-3v_2 - v_3 = -15$



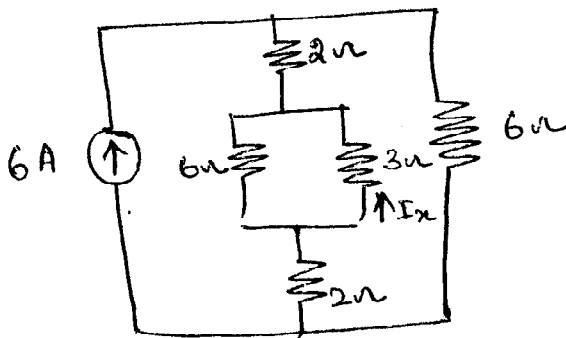
8. For the circuit shown the current i_x is

A) -2 A

B) 2 A

C) -3 A

D) 3 A



9. In a series circuit, with unequal resistances

A) the lowest resistance has the highest voltage drop

B) the lowest resistance has the highest current

C) the highest resistance has the highest voltage drop

D) the highest resistance has the most of the current through it

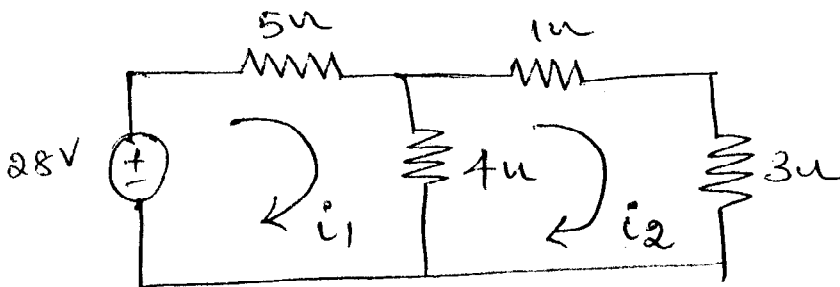
10. Using mesh analysis, the current i_1 and i_2 are

A) 8 A, 2 A

B) 4 A, 2 A

C) 2 A, 2 A

D) 4 A, 4 A

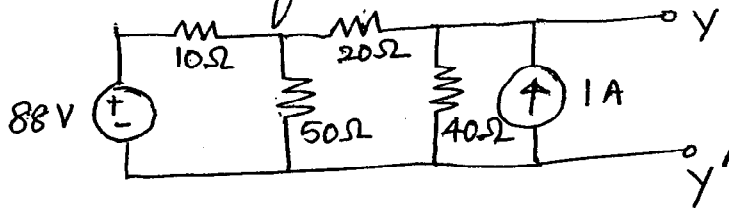


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FIRST SEMESTER 2006 – 2007
ES UC 241 ELECTRICAL SCIENCES – I
TEST 1(CLOSED BOOK)

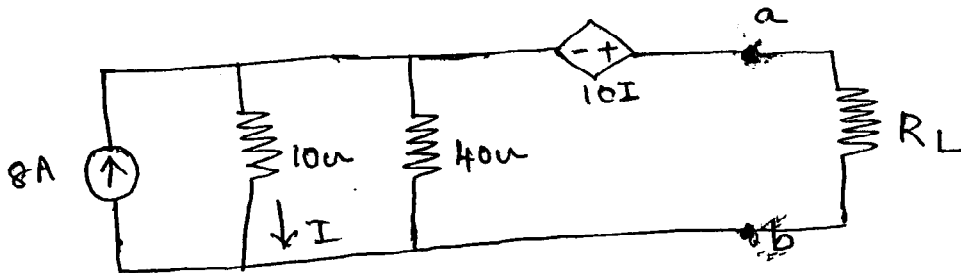
MAXIMUM MARKS: 20
DATE: 01.10.06

WEIGHTAGE: 20%
DURATION: 50 MINUTES

- ① Obtain the Thevenin equivalent of the network shown as viewed from terminals y and y' . [7 MARKS]



- ② In the circuit, what resistor R_L will absorb maximum power and what is this power? [7 MARKS]



- ③ For the given circuit find the voltage V_{12} by the technique of nodal analysis [6 MARKS]

