BITS, PILANI – DUBAI, ACADEMIC CITY, DUBAI
FIRST SEMESTER 2011 – 2012
EEE F111 ELECTRICAL SCIENCES
COMPREHENSIVE EXAMINATION (CLOSED BOOK)
MAXIMUM MARKS: 120 WEIGHTAGE: 40%
DATE: 12/01/12 DURATION: 3 HOURS

Write PART A & B in separate answer sheets
Answer all questions

PART A

1. Consider the circuit shown in Figure.1, using Mesh analysis find the unknown currents i_1, i_2 and i_3. **[12 Marks]**

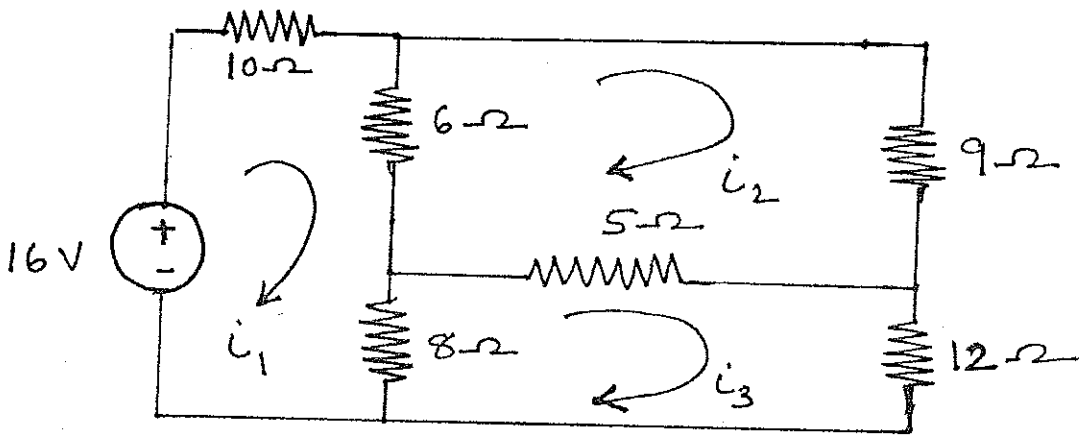


Figure 1

2. For the circuit shown in Figure 2 a) Find the Norton equivalent of the resulting circuit to the left of terminals a and b. b) Use the Norton equivalent circuit to find the current, 'i'. **[12 Marks]**

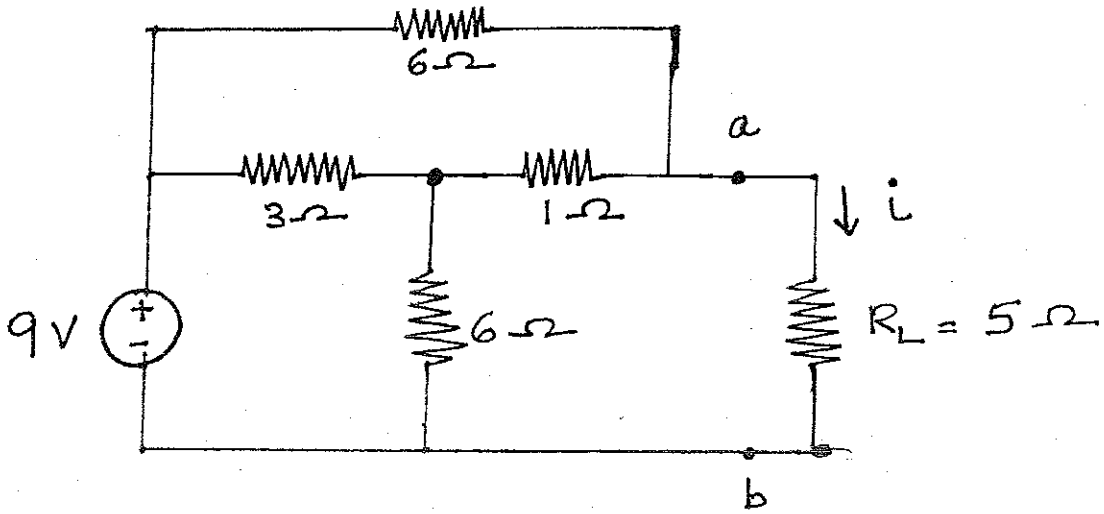


Figure 2

3. Consider the RL circuit shown in Figure 3 ,find i_1, i_2 and V_1 at time t<0 second, t>0seconds and for t= 50 milli seconds. **[12 marks]**

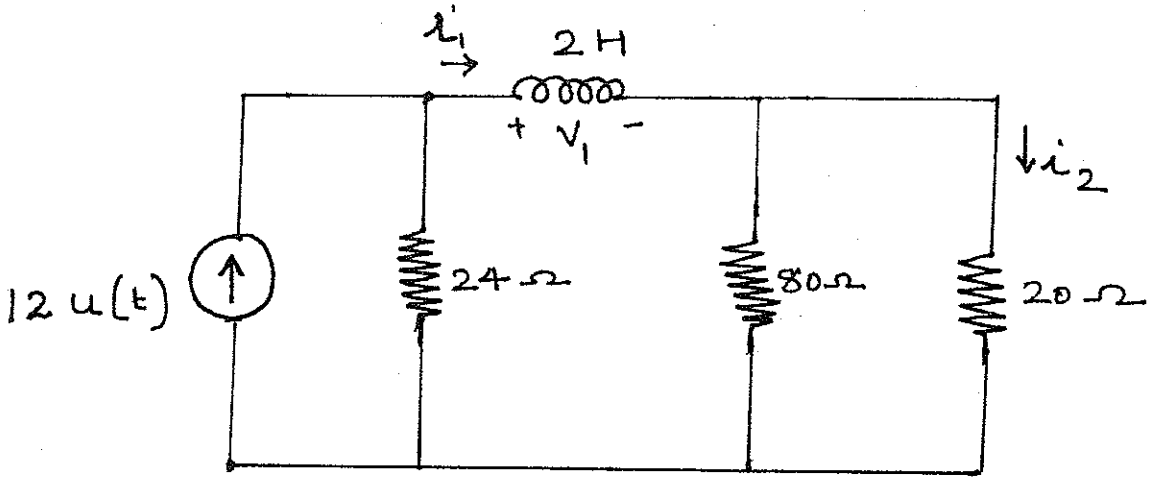


Figure 3

4. For the circuit shown in Figure.4, using the Star-Delta transformation,
   (a) Find the total current delivered by the source.
   (b) Voltage drop across 20 ohms and 10 ohms resistors. **[12 marks]**

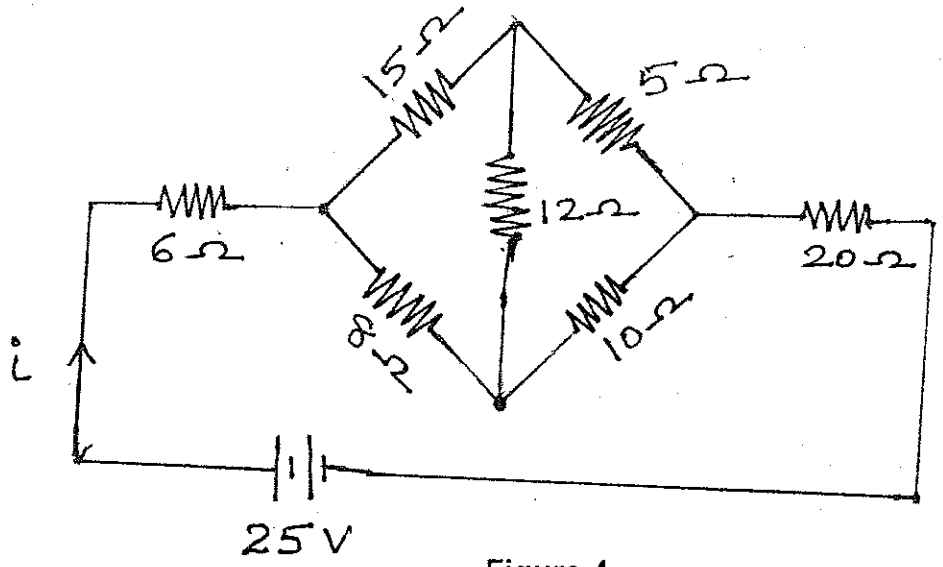


Figure 4

5. A power transformer rated 2300/230 Volts, 60 Hertz and 46 KVA gave the following data on Open circuit and Short circuit test:

   Open Circuit: 2300Volts, 0.35 Amperes, 400Watts.
   Short Circuit: 40 Volts, 20Amperes, 350Watts.

   Find the model parameters Rm, Xm, Lm Rs, Xs and Ls **[12 Marks]**

PART B

6. (a) Write short notes on:
   (i) Zener breakdown.
   (ii) Avalanche Effect
   (iii) Zener diode as Voltage Regulator. **[12 Marks]**

   (b) A silicon diode is forward biased at 20 mA and 0.8 Volts at 300 K. Find the saturation current of the diode for the case that the temperature is (i) 310K, (ii) 316 K. **[8 Marks]**

7. With the help of a neat diagram explain the construction and working of an n-channel JFET. Explain the phenomenon of "Pinch-off" in the device. **[10 marks]**

8. Draw the circuit diagram of OPAMP differential amplifier and obtain the expression for the output voltage V_o **[10 marks]**

9. For the circuit shown in Figure 5, R_B=270KΩ, R_C=1.5KΩ, V_{BB}=V_{CC}=6Volts V_{BE}=0.7 Volts and β=120.Find the value i_B, i_C and V_{CE} if the BJT is operating in the active region **[10 marks]**

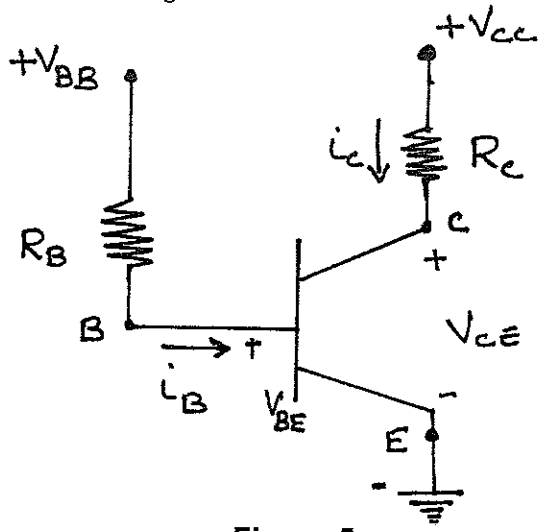


Figure 5

10. Realize the following gates using NAND Gate
    (a) AND
    (b) OR
    (c) NOT. **[4+4+2 marks]**

BITS, PILANI – DUBAI CAMPUS,
DUBAI INTERNATIONAL ACADEMIC CITY, DUBAI
FIRST SEMESTER 2011 – 2012
EEE F111 ELECTRICAL SCIENCES
TEST 2(OPEN BOOK)

MAXIMUM MARKS: 60 WEIGHTAGE: 20%
DATE: 22/12/11 DURATION: 50 MINUTES

1. The Zener diode in the voltage regulator circuit shown in Figure 1 has a breakdown voltage of 9 Volts and is to operate with a reverse current between 10 milli Amperes and 100 milli Amperes. Find the range of the load resistance R_L that results in a 9 volts load voltage when Vs= 24 Volts. Given R=200 Ω

[20 marks]

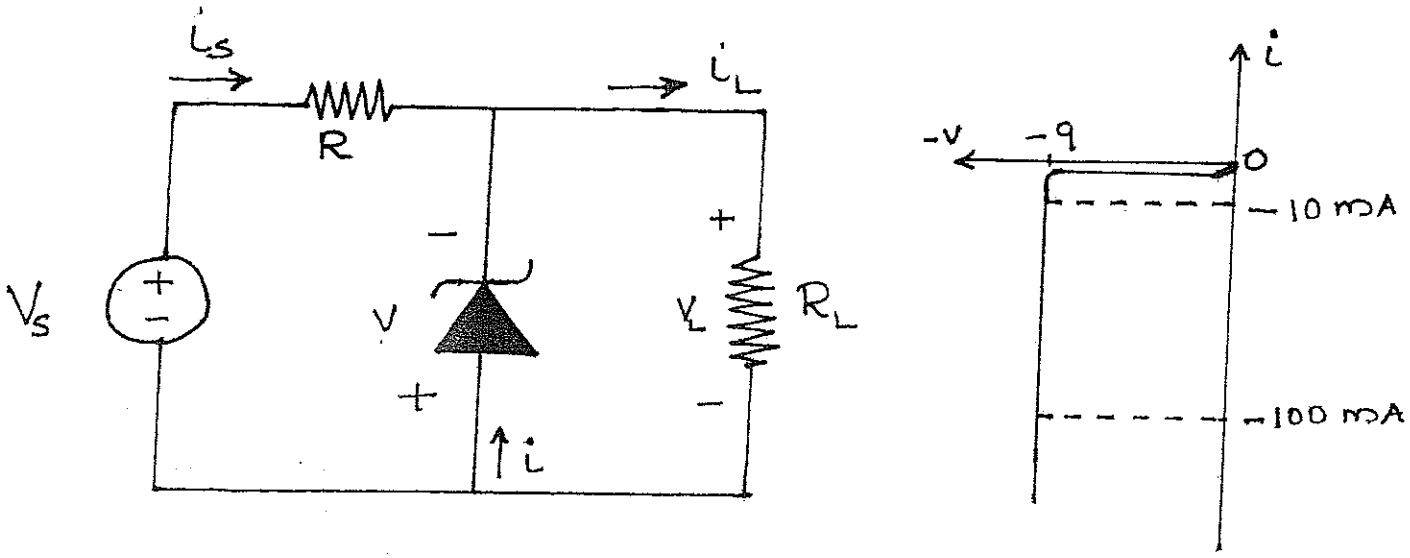


Figure 1

2. For the circuit shown in Figure.2 using star/delta transformation, determine
   (a) The total current delivered by the source.
   (b) The voltage drop across 20 Ω resistor. **[20 marks]**

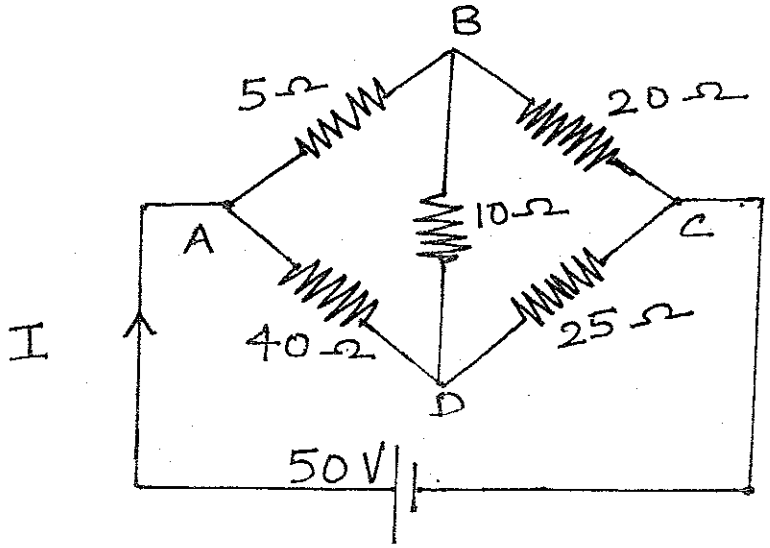


Figure 2

[Please Turn Over]

3. Figure.3 shows a rectangular magnetic core with an air-gap. Find the exciting current needed to cause a flux density of B_g= 1.2 Tesla in the air-gap. Given N=400 turns and μ_r (iron) =4000.Neglect the effect of flux fringing. $\mu_0 = 4\pi \times 10^{-7}$

[20 marks]

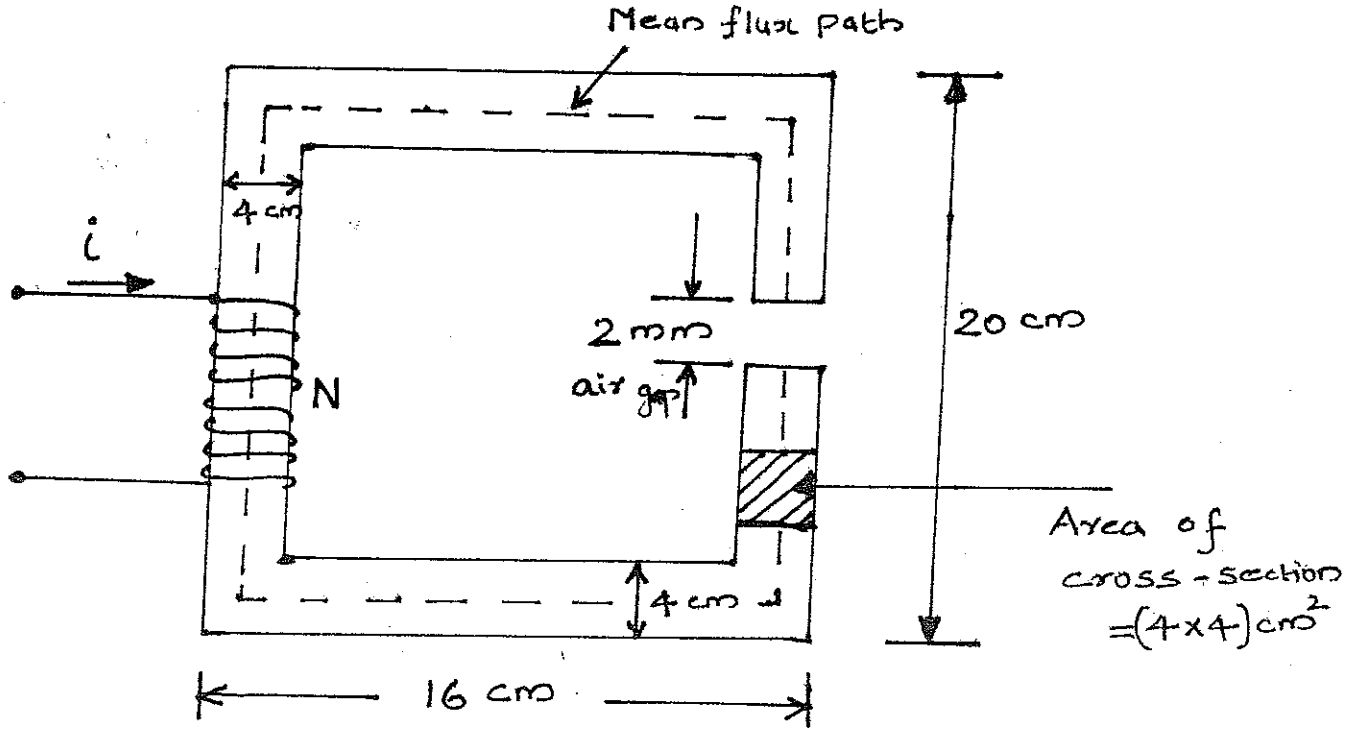


Figure 3

BITS, PILANI – DUBAI CAMPUS,
DUBAI INTERNATIONAL ACADEMIC CITY, DUBAI
FIRST SEMESTER 2011 – 2012
EEE F111 ELECTRICAL SCIENCES
TEST 1(CLOSED BOOK)

MAXIMUM MARKS: 75 **WEIGHTAGE: 25%**
DATE: 03/11/11 **DURATION: 50 MINUTES**

1. Consider the circuit shown in Figure1 find the current i1, when (a) k= 3, (b) k= 1.5, (c) K= 2.5. **[25 marks]**

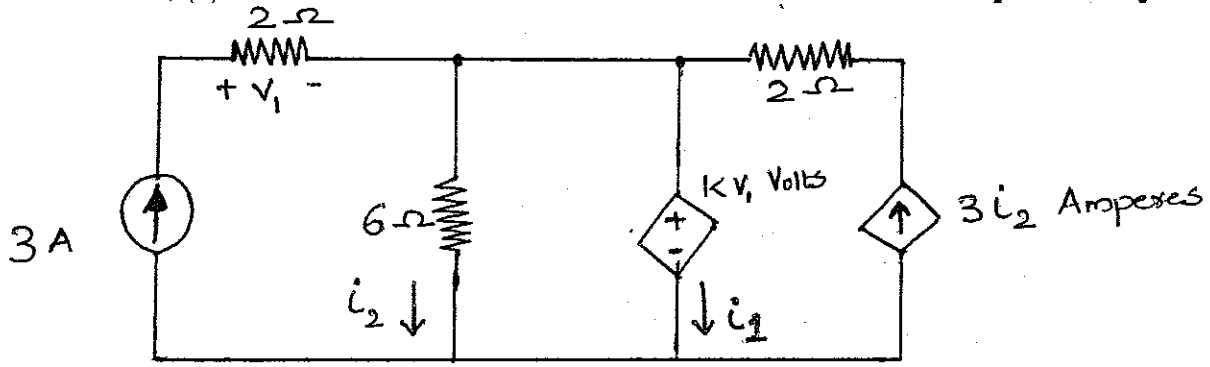


Figure 1

2. For the circuit shown in Figure 2, (a) Find the Norton's equivalent of the circuit. (b) Use the Norton equivalent circuit to find the current(i) and the power absorbed by R_L, when R_L= 6 ohms.(c) Determine the value of R_L, which absorbs the maximum amount of power and find the value of power. **[25 marks]**

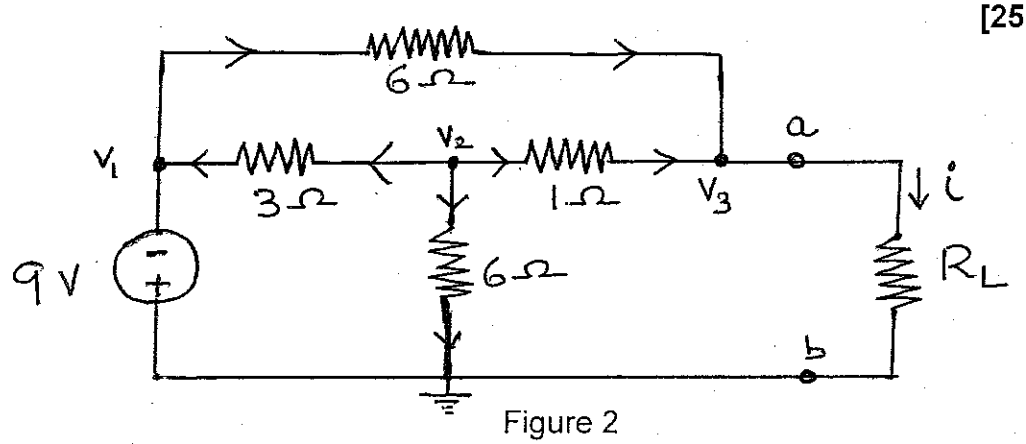


Figure 2

3. For the series RLC circuit shown in Figure3, determine the natural response v(t) and i(t) for t≥ 0 seconds given that the initial conditions are v(0)= 2 Volts and i(0)= 1 Ampere. **[25 marks]**

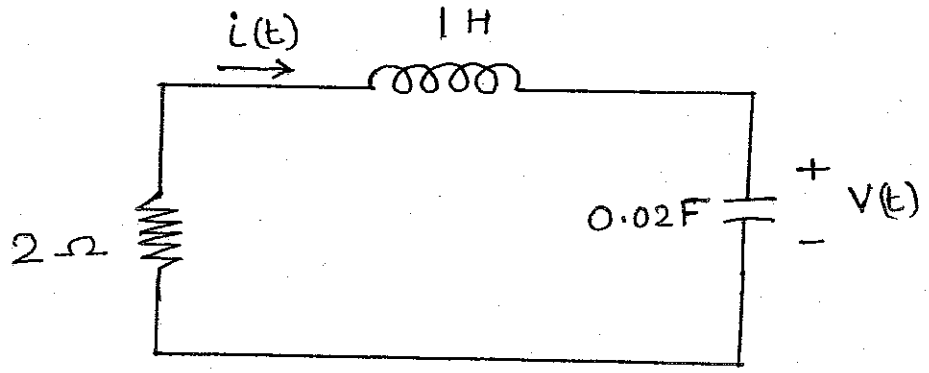


Figure 3

BITS, PILANI – DUBAI CAMPUS
DUBAI INTERNATIONAL ACADEMIC CITY
FIRST SEMESTER 2011 – 2012
EEE F111 ELECTRICAL SCIENCES
QUIZ 2 (CLOSED BOOK)

MAXIMUM MARKS: 21 | SET 1 | WEIGHTAGE: 7 %
DATE: 12.12.11 | DURATION: 20 MINUTES

NAME:	Id. No.:

1. The analogous parameter for Electric current in magnetic circuit is_____ [1M]

2. Convert the delta connect network shown in figure 1 to equivalent star connected network and find R_A, R_B and R_C [5 M]

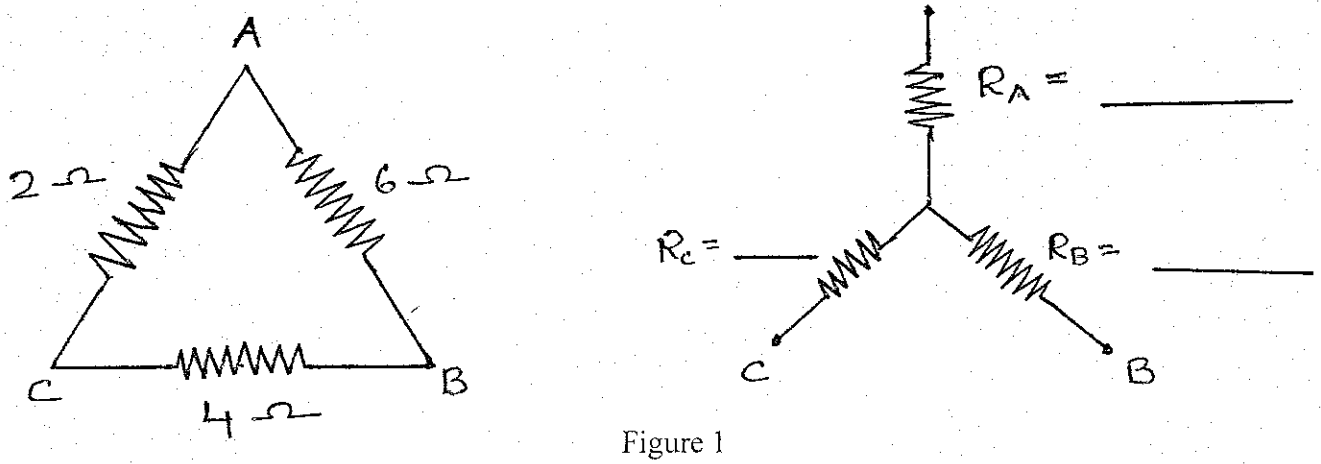


Figure 1

3. Power losses in a transformer core are due to_____ and _____ [2 M]

4. Find the reluctance offered for a coil having 50 turns and 5 H. [3M]

5. The energy stored in an ideal transformer is _____. [1 M]

6. Write the expression for generated voltage in DC Generators. [2 M]

7. The device used to measure power is _____ [1 M]

8. A 220 V dc shunt motor has a speed of 1500 rpm and an armature current of 5 Amperes at no load. Armature resistance of the motor is 0.5 ohms. Determine the motor speed when the armature current is 35 Amperes at full load. [6 M]

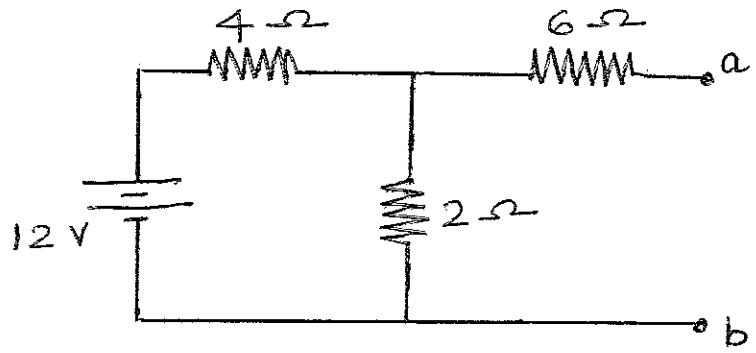
BITS, PILANI – DUBAI CAMPUS
DUBAI INTERNATIONAL ACADEMIC CITY
FIRST SEMESTER 2011 – 2012
EEE F111 ELECTRICAL SCIENCES
QUIZ 1 (CLOSED BOOK)

MAXIMUM MARKS: 24 | SET 1 | WEIGHTAGE: 8 %
DATE: 03.10.11 | DURATION: 20 MINUTES

NAME: Id. No.:

1. Two resistances are joined in parallel whose resultant resistance is 6/5 ohms. One of the resistance wires is broken and the effective resistance becomes 2 ohms. Then the resistance of the wire that got broken is _____ [3M]

2. For the circuit shown below find out Norton equivalent resistance R_N _____ and the Current Source value _____ [3M]



3. An ideal voltage source is described by a function v(t) = 5 Sin(∏/2)t. The value of this voltage source when t= 1 sec is _____V

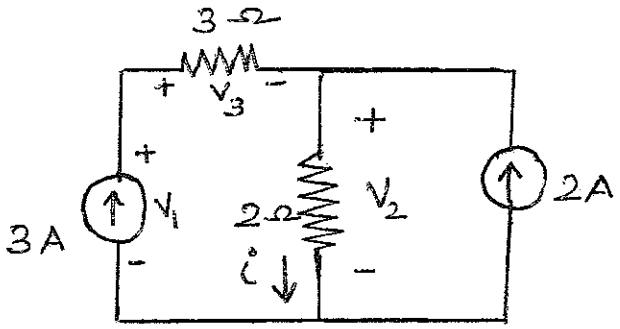
[2M]

4. Identify the incorrect statements with respect to the Thevenin theorem [2M]

I. Remove the load to find open circuit voltage
II. Short circuit the load to find the open circuit voltage
III. Open circuit all voltage sources to find Thevenin's equivalent resistance R_0
IV. Short all the voltage sources to find Thevenin's equivalent resistance R_0

A. III , IV
B. II, III
C. I,II
D. All are incorrect

5. Find the variables indicated for the circuit shown below [2 + 2 M]



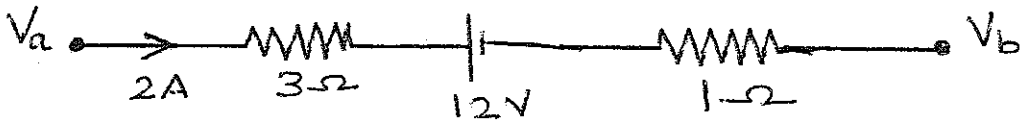
V_1 = _____

V_2 = _____

V_3 = _____

i = _____

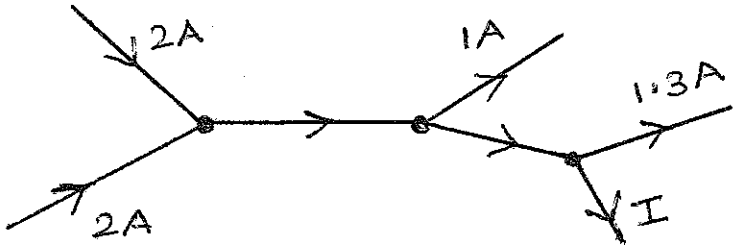
6. The circuit shown below forms a part of a closed circuit. Then Va-Vb is_____ [2M]



7. A closed switch has a resistance of [1M]
   (a) Zero Ω
   (b) infinite Ω
   (c) above 10 Ω
   (d) at least 1 kΩ

8. A uniform wire of resistance R is divided into 10 equal parts and all of them are connected in parallel. The equivalent resistance will be _____ [2M]

9. The current 'I' in the electric circuit shown below is _____ [2M]



10. An electrical fan and a heater are marked 100 Watts, 220 Volts and 1000 Watts, 220 Volts respectively. The resistance of the heater is [3M]

(a) ZERO (b) Greater than that of Fan

(c) Less than that of Fan (d) Equal to that of Fan