Department of Computer Science & Engineering

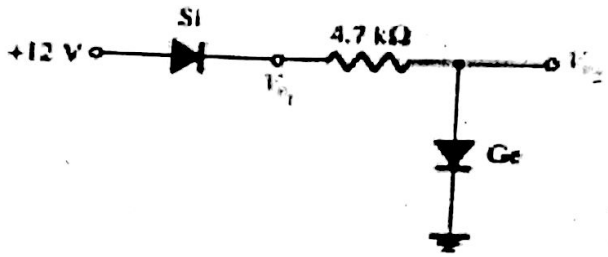
In-course - 1, EEE- 1222 (Basic Electronics)

Marks - 30 **Time - 1hr**

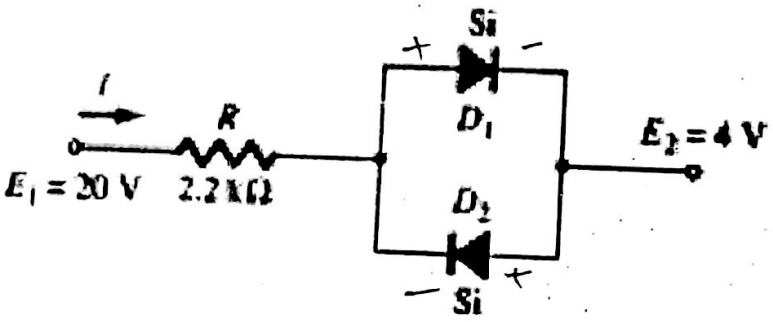
Answer all questions:

1. Explain the diode operating conditions in reversed bias. What is a Zener region? 3 + 2 =5
2. Describe the working principles of a Full-Wave Rectification with bridge configuration. 5

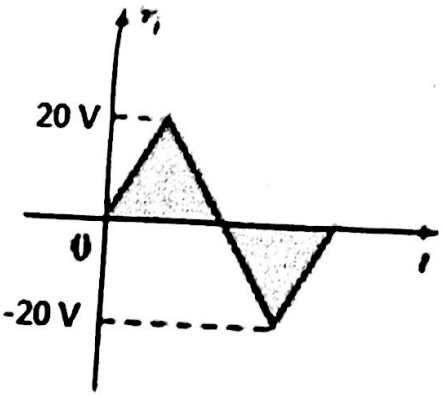
3. a. Determine the current V_{o1} and V_{o2} from the following network: 2.5

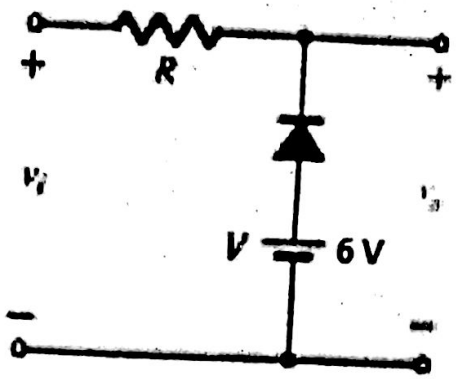


b. Determine the current I from the following network: 2.5

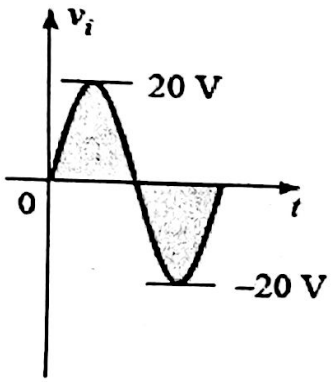


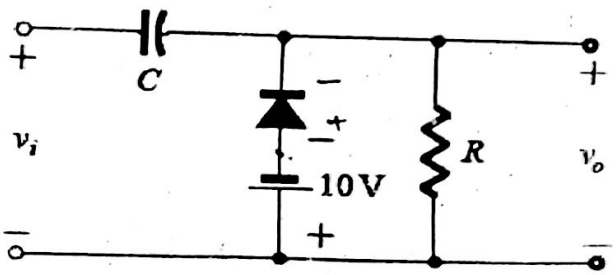
4. a. Determine the output waveform v_0 for the following Clipper network: 2.5





b. Determine the output waveform v_0 for the following Clamper network: arks:





5. a. Prove that: $\beta = \alpha / (1 - \alpha)$ where α= current amplification factor and β = current gain.

b. Determine α, β and γ rating from a network where $I_B = 240\ \mu A$, $I_E = 12$ mA and $I_C = 11.76$ mA.

6. a. Describe cut off, saturation and active region of operation for a transistor with diagram.

b. Draw the transistor load line analysis curve for Common Emitter configuration.

Midterm - 2, EEE- Basic Electronics 1222

Marks - 30 **Time - 1hr**

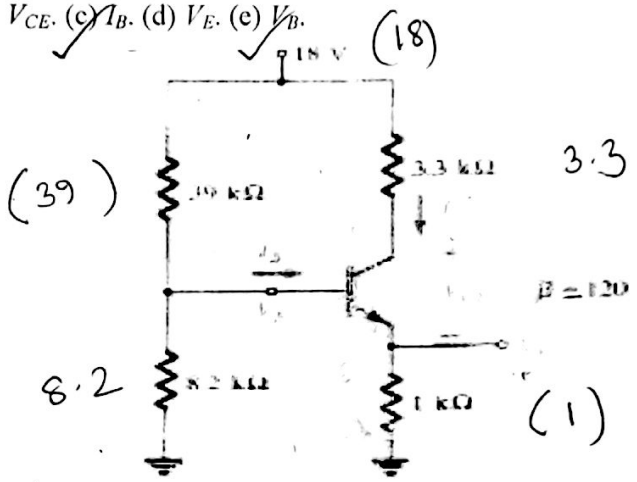
Answer all questions:

1 Draw the circuit diagram of an Emitter-Stabilized Bias Circuit and Derive the value of V_{CE} and I_C. 5.0

2 Write down the working principle of an Integrator. 5.0

3 What is Faithful Amplification? Explain the conditions of a faithful amplification. 5.0

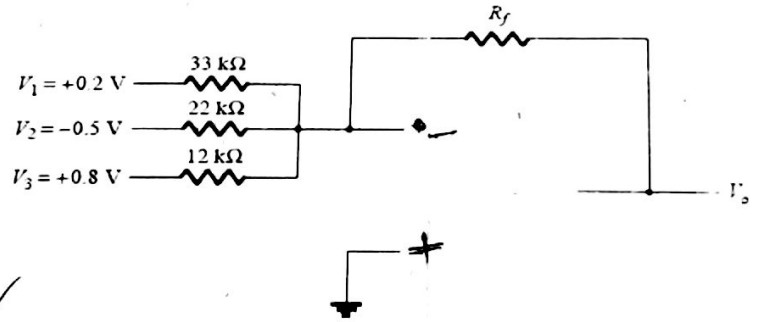
4 Determine the following for the voltage-divider configuration of the following Figure using the approximate approach if the required conditions are satisfied. 5.0
(a) I_C. (b) V_{CE}. (c) I_B. (d) V_E. (e) V_B.



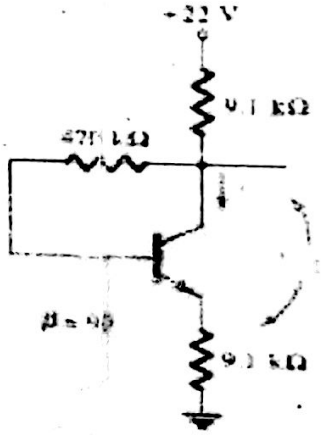
5. a) What is CMRR? Derive the value of Ac and Ad to calculate the value of CMRR. 3.0

b) Calculate the CMRR (in dB) for the circuit measurements of Vd = 1 mV, Vo = 120 mV, and V_C = 1 mV, Vo = 20 μV. 2.0

6 a) Calculate the output voltage of the c rcuit in the following Figure for Rf = 68 kΩ 2.5



b) Determine the level of I_C and V_{CE} for the network of the following figure. 2.5



Marks - 30 **Time - 1hr**

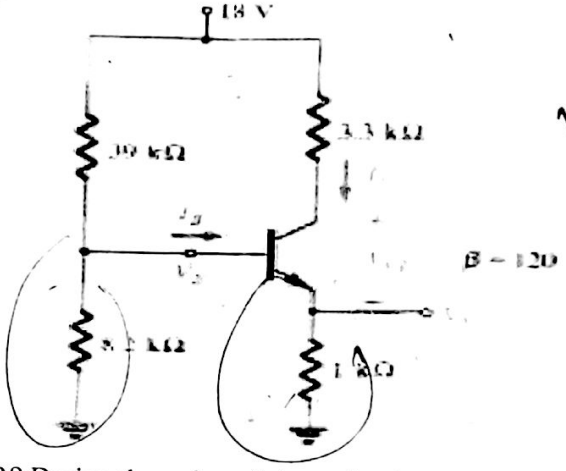
Answer all questions:

1. Draw the circuit diagram of an Emitter-Stabilized Bias Circuit and Derive the value of V_{CE} and I_C. 5.0

2. Write down the working principle of an Integrator. 5.0

3. What is Faithful Amplification? Explain the conditions of a faithful amplification. 5.0

4. Determine the following for the voltage-divider configuration of the following Figure using the approximate approach if the required conditions are satisfied: 5.0
(a) I_C. (b) V_{CE}. (c) I_B. (d) V_E. (e) V_B.



5. a) What is CMRR? Derive the value of Ac and Ad to calculate the value of CMRR. 3.0

b) Calculate the CMRR (in dB) for the circuit measurements of Vd = 1 mV, Vo = 120 mV, and V_C = 1 mV, Vo = 20 μV. 2.0

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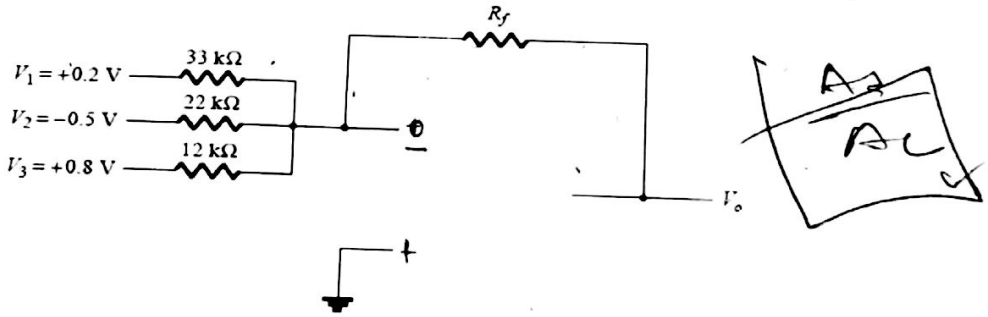
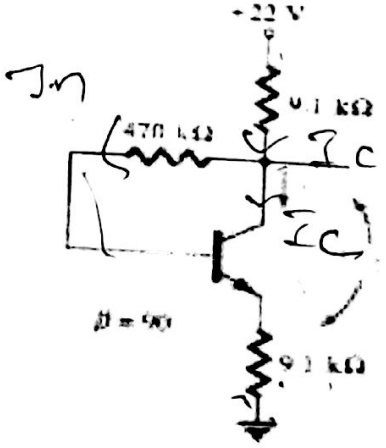


b) Determine the level of I_C and V_{CE} for the network of the following figure. 2.5



1. Find the color code for a 220Ω resistor with 10% tolerance. [3]
2. How long must a steady current of 2A exist in a resistor that has 3V across it to dissipate 12J energy? [3]
3. If two systems in cascade each have an efficiency of 80% and the input energy is 60J, what is the output energy? [3]
4. Find the unknown resistance R of the network in Figure 1. [4]

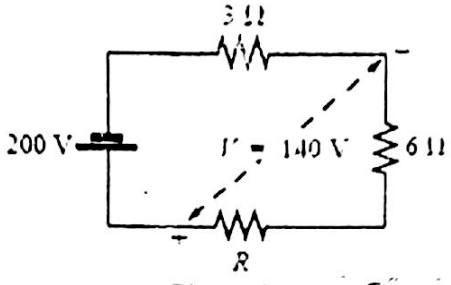


Figure 1

5. Determine the unknown currents I_1, I_2, I_3 in Figure 2. [3]

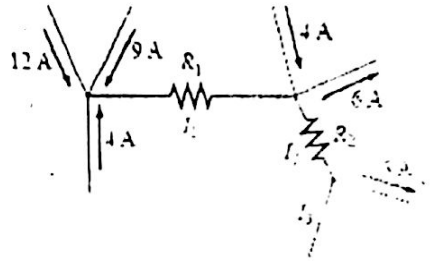


Figure 2

6. For Figure 3: [8]
   i. Calculate R_T
   ii. Determine I and I_1
   iii. Find V_3

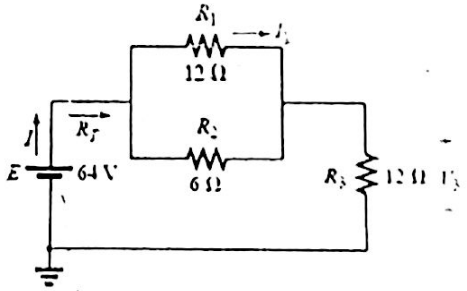


Figure 3

7. Convert the network in Figure 4 into a single source network and find the voltage drop across R2. [6]

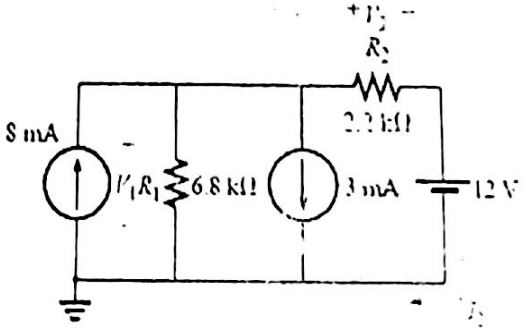


Figure 4

!! Best of Luck !!

University of Dhaka

Department of Computer Science and Engineering

1st Year 1st Semester B.Sc. Examination 2011

EEE - 1121 : Electrical Circuit Analysis

Total Marks: 60 **Time: 2.5 Hours**

[Answer any four (4) of the following Questions.]

1. (a) Find the range in which a resistor having the following color bands must exist to satisfy the manufacturer's tolerance: 3

1st resistor:	green	blue	orange	gold
2nd resistor:	red	red	brown	silver

(b) A stereo system draws 2.5A at 120V. The audio output power is 150W. How much power is lost in the form of heat in the system? What is the efficiency of the system? 4

(c) A 10Ω resistor is connected across a 15-V battery. 4

i. How many joules of energy will it dissipate in 1 minute?

ii. If the resistor is left connected for 2 minutes instead of 1 minute, will the energy used increase? Will the power dissipation level increase?

(d) Determine the current I and the voltage V_1 for the network of Figure 1.

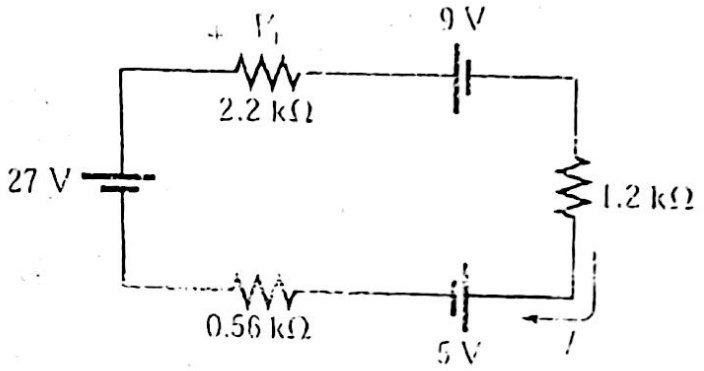


Figure 1: Problem 1(d)

2. (a) Find I, V_3, R_3 and V_2 from the circuit of Figure 2. 6

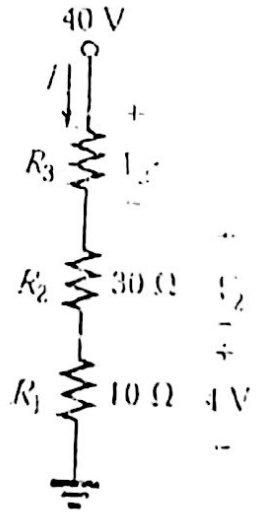


Figure 2: Problem 2(a)

(b) Determine the unknown resistors of Figure 3 if $R_1 = 5R_2$ and $R_3 = \frac{1}{2}R_2$.

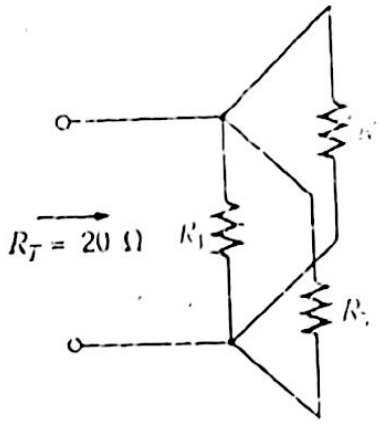


Figure 3: Problem 2(b)

(c) For the network of Figure 4:

i. Find the total resistance.

ii. Find the current I_1 and I_2.

iii. Find the power dissipated by the 4-ohm resistor.

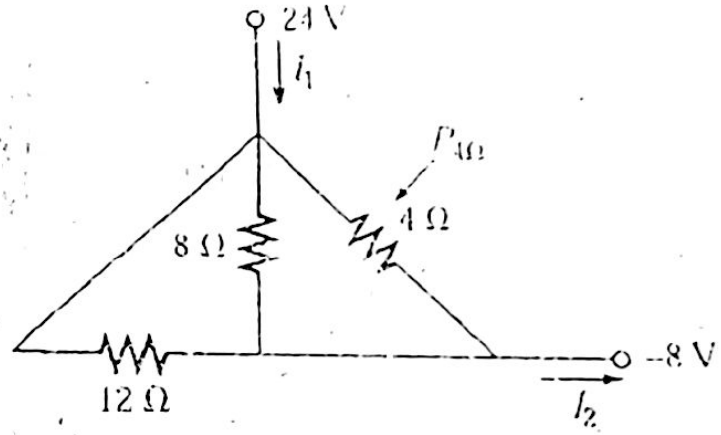


Figure 4: Problem 2(c)

3. (a) State Kirchhoff's current law. Using the information provided in Figure 5, find the branch resistors R_1 and R_3, the total resistance R_T and the voltage source E.

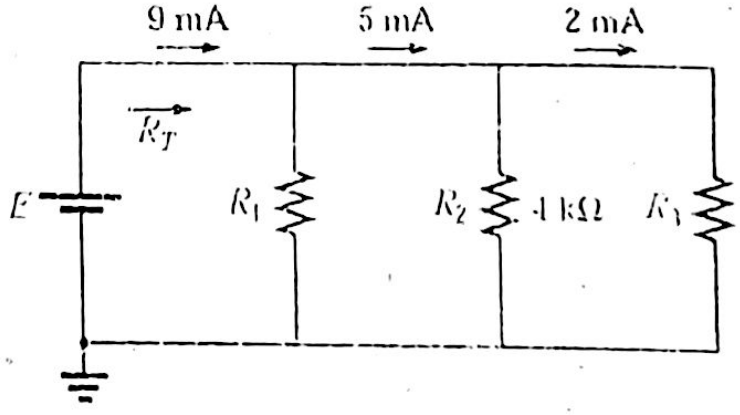


Figure 5: Problem 3(a)

(b) State current divider rule. Using the current divider rule, find the unknown currents for the network of Figure 6 5

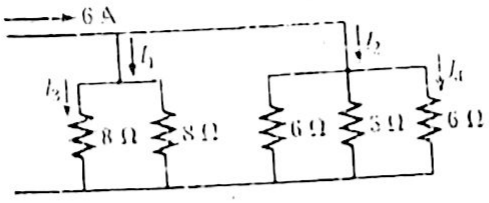


Figure 6: Problem 3(b)

(c) For the network of Figure 7: 5

i. Find the current I_3 using mesh analysis.

ii. Based on the results of part (i), how would you compare the application of mesh analysis to the branch current method?

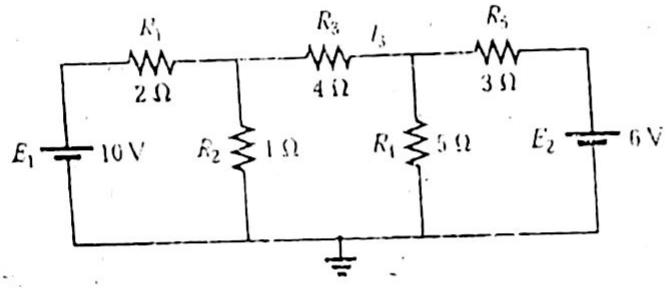


Figure 7: Problem 3(c)

4. (a) Mention the steps of finding the Norton's equivalent network with appropriate example. 5

(b) Find the Thevenin's equivalent circuit for the network in Figure 8 across R. 5

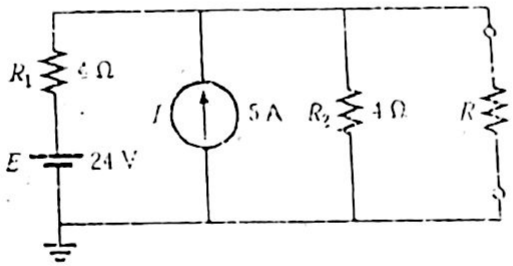


Figure 8: Problem 4(b)

(c) For the circuit of Figure 9: 6

i. Calculate the time required for the circuit to reach open circuit condition.

ii. Find the time required for V_c to reach 60V following the closing of the switch.

iii. Calculate the current i_C at the instant V_C=60V.

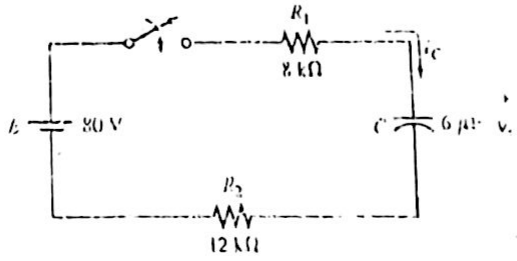


Figure 9: Problem 4(c)

(a) Show mathematically that, a capacitor can be replaced by an open circuit equivalent once the charging phase in a dc network has passed.

(b) Prove mathematically that, the area of the positive pulse of a sine wave is 2A_m

(c) Find the phase relationship between the waveforms of each set:

i. $v = 0.2 \sin(\omega t - 60°)$
$i = 0.1 \sin(\omega t + 20°)$

ii. $v = 4 \sin(\omega t + 50°)$
$i = 6 \sin(\omega t + 40°)$

iii. $v = 200 \sin(\omega t - 210°)$
$i = 25 \sin(\omega t - 60°)$

6. (a) State the Maximum Power Transfer Theorem for ac network.

(b) Find the Norton's equivalent circuit for the network of Figure 10.

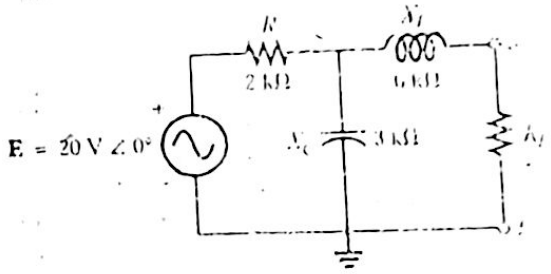


Figure 10: Problem 6(b)

(c) Using the Δ-Y or Y-Δ conversion, find the current I from Figure 11.

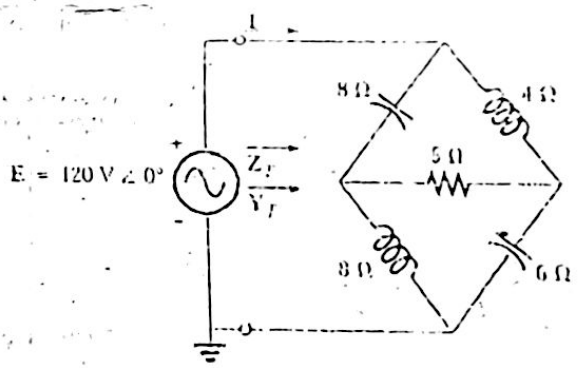


Figure 11: Problem 6(c)

(d) Write the mesh equations for the circuit of Figure 12

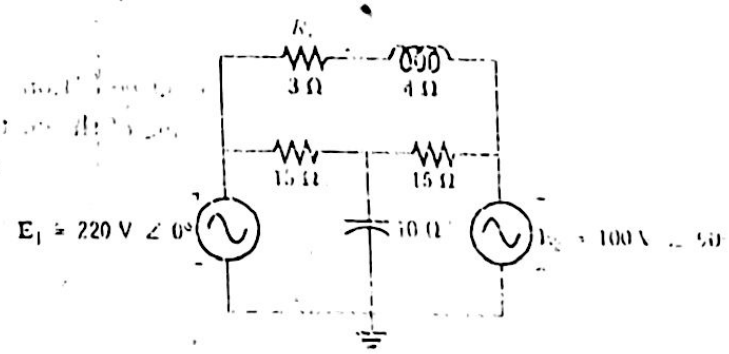


Figure 12: Problem 6(d)

Total Marks: 35

1. How many equations are required to solve the following window system networks? Consider: 6
   1) each branch contains some element/s (voltage source, current source or resistor)
   2) the networks meet the conditions of the mentioned approaches.

Mesh Analysis (General Approach)				
Mesh Analysis (Format Approach)				
Nodal Analysis (General Approach)				

2. Consider the network in **Figure: 1**. 4
   a) Find the branch-current using nodal analysis (general approach). 4
   b) Find the branch-current using nodal analysis (format approach). 1
   c) Is there any better approach to find the branch-currents?

Figure: 1

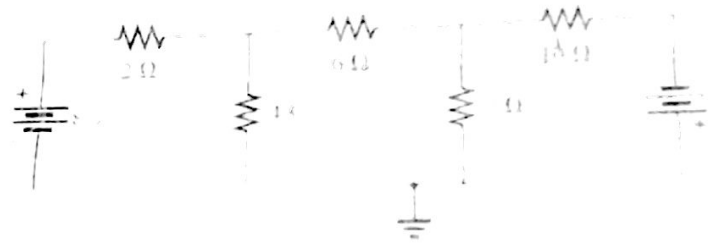


Figure: 2

3. *Consider the network in* **Figure: 2**.
   a) *Write down the equations for the branch-currents using mesh (format approach) and nodal (general approach)* 5
   b) *Is there any better approach to find* $V_{4\Omega}$? 1

4. *Consider the network in* **Figure: 3**.
   a) Replace the Π configuration (composed of ? kΩ resistors) with a T configuration and solve the source current I_s. 3
   b) Can you use format approach of mesh analysis and check your result? 4

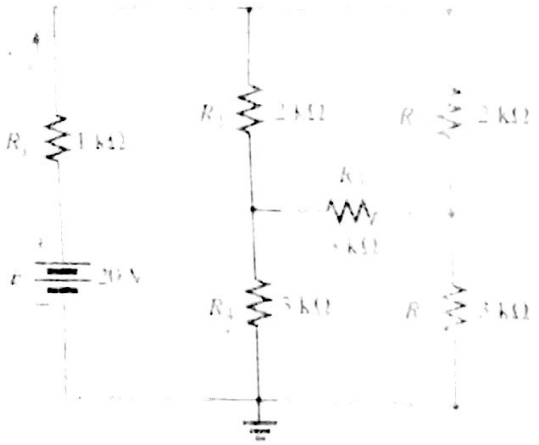


Figure: 3

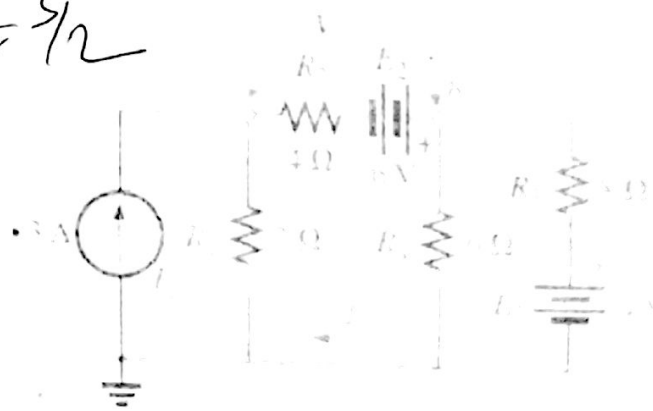


Figure: 4

5. a) For the network in **Figure: 4**, determine the current I_2 using any method, and then find the voltage V_{ab}. 5
   b) Which method will be easier to solve question 4(a) – mesh analysis (format approach) or nodal analysis (format approach)? Show causes. 2

3. a) For the network in **Fig. 3.1**, determine voltages V_1, V_2, and current I. 4

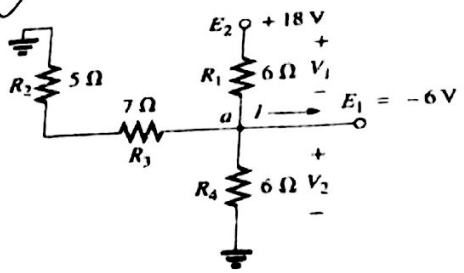


Fig. 3.1

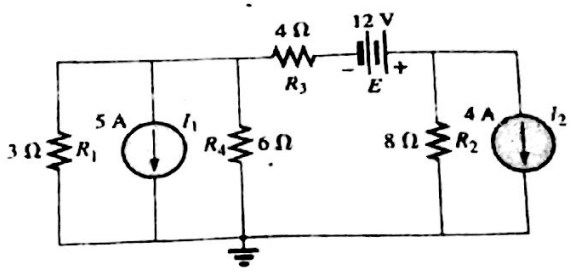


Fig. 3.2

b) Write the nodal equations for the network in **Fig. 3.2** and solve for the nodal voltages. 5

c) For the network in **Fig. 3.3**: 4

i) Determine the voltage V_{ab}.

ii) Calculate the current I.

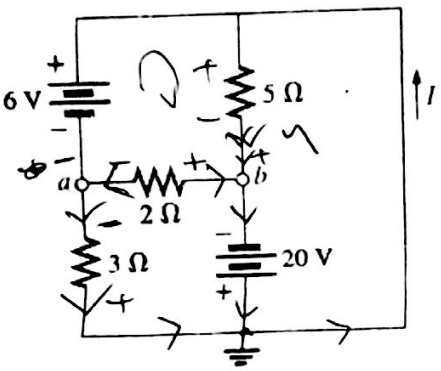


Fig. 3.3

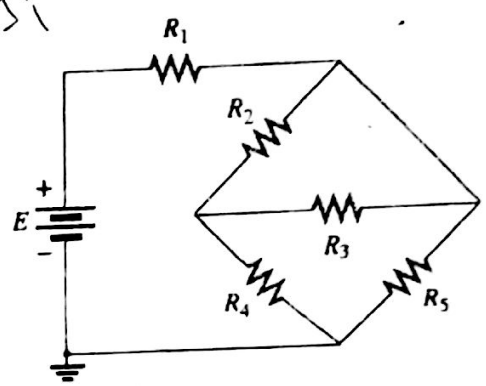


Fig. 3.4

d) What is the equivalent resistance, R_T of the network in **Fig 3.4**. 2

4. a) For the following network in **Fig. 4.1**, find the voltage $V_{7\,k\Omega}$ using: 9

i) Mesh Analysis

ii) Nodal Analysis

iii) Superposition theorem

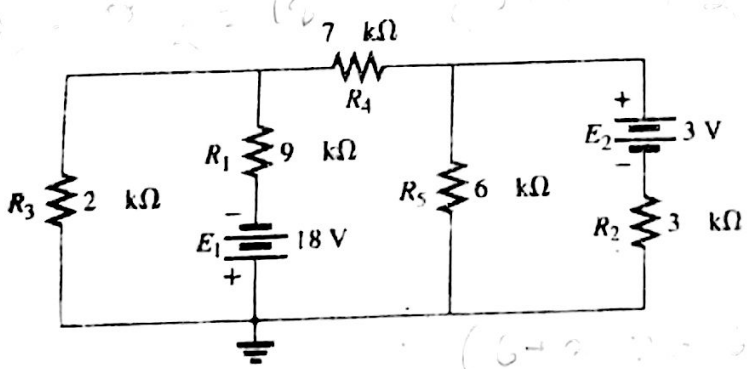


Fig. 4.1

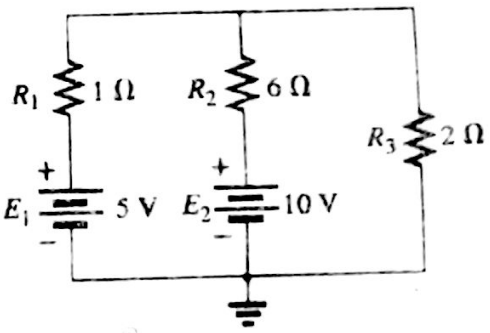


Fig. 4.2

b) i) Using Millman's theorem, find the current through and voltage across the resistor R_3 in **Fig. 4.2**. 3+3

ii) Find the same using nodal analysis.

5. a) Considering network in **Fig. 5.1**: 5

i) Replace the T configuration (composed of 6 kΩ resistors) with a Π configuration.

ii) Solve for the source current I_{s1}.

University of Dhaka
First Year First Semester B.Sc. Final Examination, 2015
Department of Computer Science & Engineering, Dhaka University
EEE – 1121: Electrical Circuit Analysis

Time: 2.5 Hour

Total Marks: 60

[Answer any Four (4) of the following Questions]

1. a) Define and plot relationship between Ohm's Law and equation of a straight line. How magnitudes of the resistors affect the graph? 4

b) *"In any configuration, if two elements are in series, the current must be the same. However, if the current is the same for two adjoining elements, the elements may or may not be in series."* – explain. 3

c) Explain if the sources can be connected in the following arrangements: 4
i) Voltage sources in series
ii) Voltage sources in parallel
iii) Current sources in series
iv) Current sources in parallel

d) i) Given the characteristics in Fig. 1.1, determine the voltage regulation of the supply. 4
ii) Determine the internal resistance of the supply.

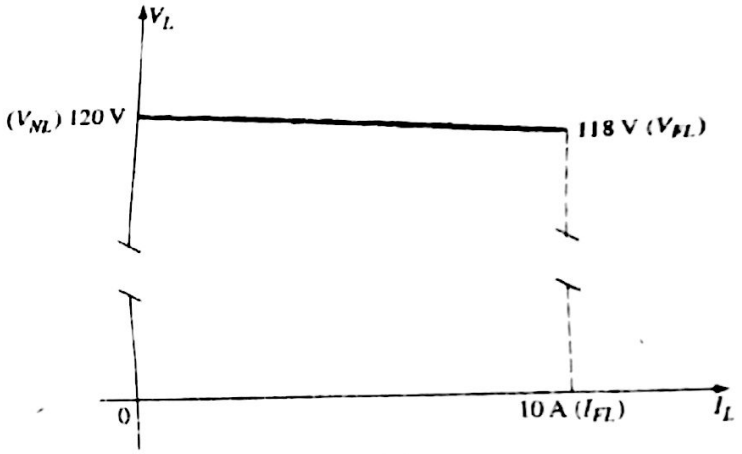


Fig. 1.1

2. a) A 2 hp motor operates at an efficiency of 75%. What is the power input in watts? If the applied voltage is 220 V, what is the input current? 3

b) Explain *"In a series circuit the voltage across series resistive elements will divide as the magnitude of the resistance levels"*. Design the voltage divider circuit in **Fig. 2.1** such that $V_{R1} = 4V_{R2}$. 3+3

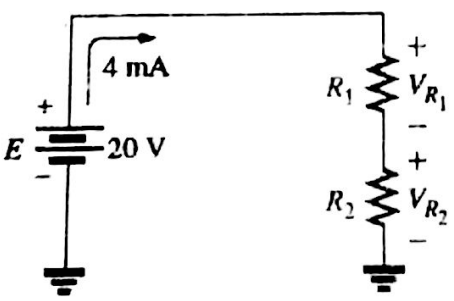


Fig. 2.1

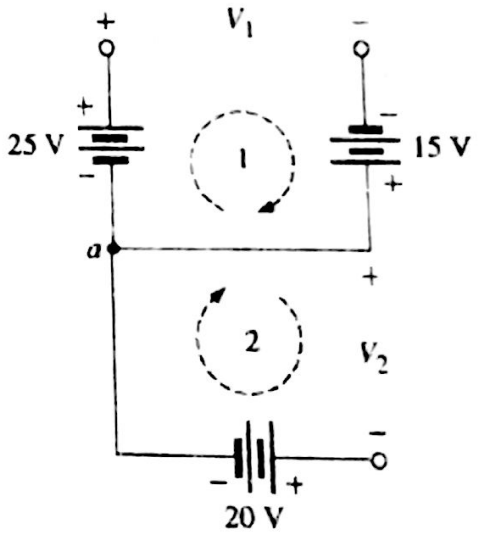


Fig. 2.2

c) Describe Kirchhoff's voltage law with example. Find V_1 and V_2 for the network in **Fig. 2.2**. 3+3

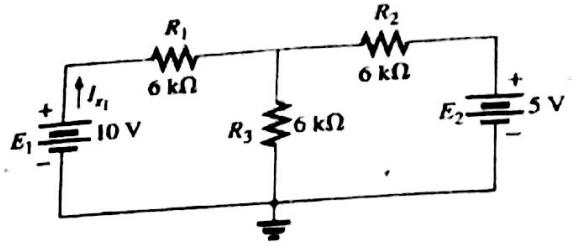


Fig. 5.1

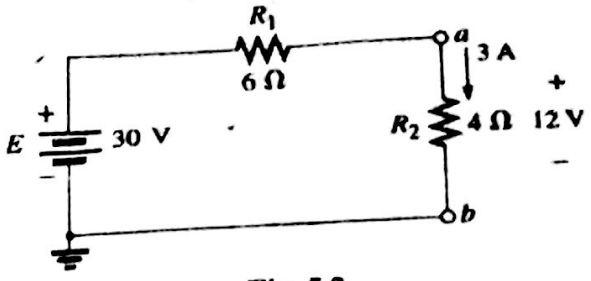


Fig. 5.2

b) State substitution theorem. Show at least 4 equivalent branches for the branch a-b in fig. 5.2 using substitution theorem. 1+2

c) i) Find the Thévenin equivalent circuit for the network external to the resistor R for the network in **Fig. 5.3**. 3+4
ii) Find the Norton equivalent circuit for the same and check the terminal characteristics (voltage across and current through R) against R.

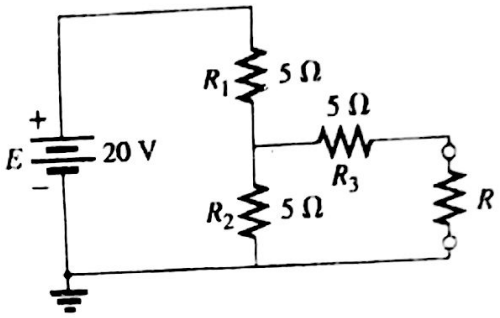


Fig. 5.3

6. a) *Using superposition, find the current I through the 24 V source in* **Fig. 6.1** 4

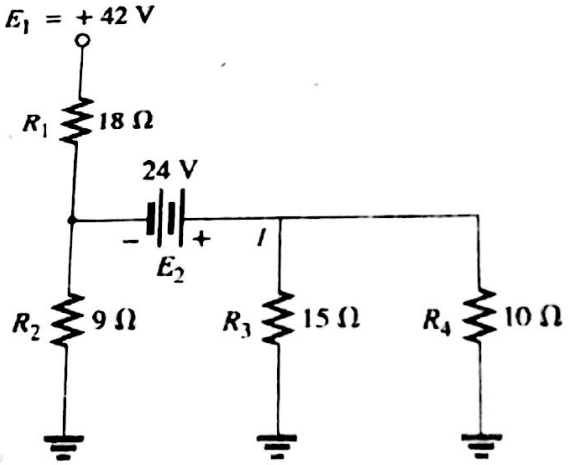


Fig. 6.1

b) i) For the network in **Fig. 6.2**, determine the value of R for maximum power to R 4+1
ii) Determine the maximum power to R.

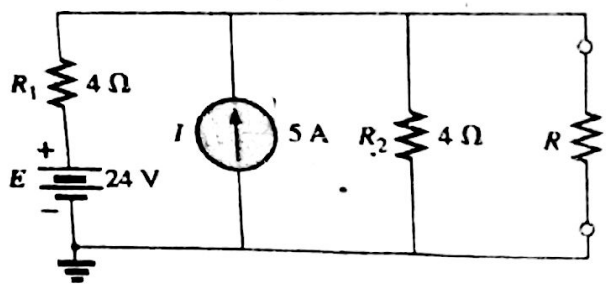


Fig. 6.2

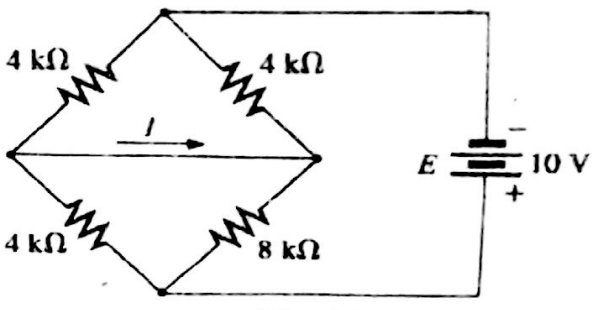


Fig. 6.3

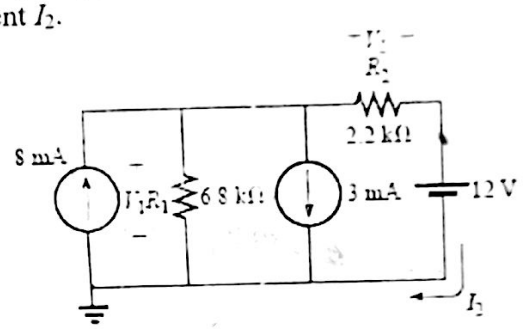
c) i) For the network in **Fig. 6.3**, determine the current I. 3+3
ii) Is the reciprocity theorem satisfied?

Department of Computer Science & Engineering, Dhaka University
Second In-Course Examination
1st Year 1st Semester B.Sc., Session: 2012-2013
EEE – 1121, Electrical Circuit Analysis

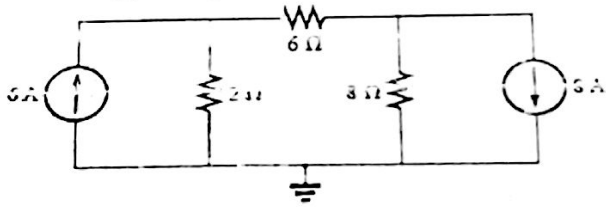
Time: 1 Hour

Total Marks: 35

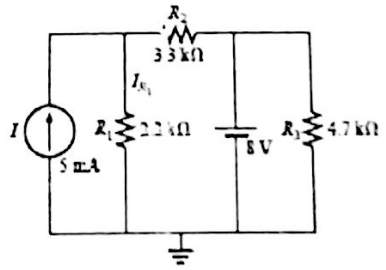
1. a) Draw a practical voltage source and current source and prove that ***source conversions are equivalent only at their external terminals.*** 1+3
   b) Is it possible to connect current sources of different current ratings in series? Why? 2
   c) For the network for the following figure: 4
      i) Convert the voltage source to a current source.
      ii) Reduce the network to a single current source, and determine the voltage V_1.
      iii) Using the results of part (b), determine V_2.
      iv) Calculate the current I_2.



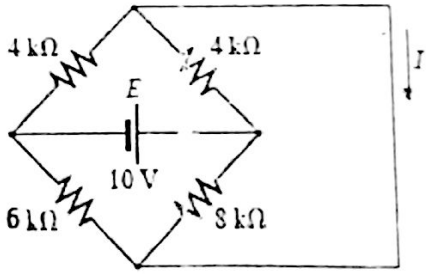
2. a) Briefly describe the concept of supermesh current. 2
   b) i) Using mesh analysis, determine the currents for the following network. 4+4
      ii) Using nodal analysis, determine the nodal voltages as well as currents for the same network. [Hint. Use format approach]



3. a) What are relative advantages of Thevenin's theorem? 2
   b) i) Using superposition, find the current through R_1 for the following network. 4+4
      ii) Find the Thevenin's equivalent circuit for the same external to the R_1 and prove that the same current is passing through R_1



4. a) What is the limitation of reciprocity theorem? 1
   b) Prove the reciprocity theorem for the following network for the voltage E and current I. 4

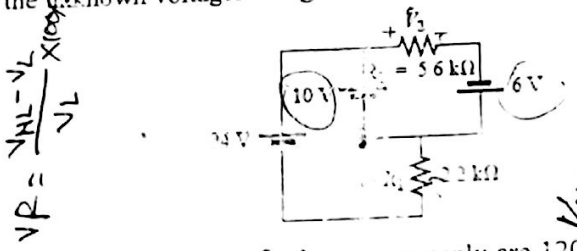


Department of Computer Science & Engineering, Dhaka University
First In-Course Examination
1st Year 1st Semester B.Sc., Session: 2012-2013
EEE – 1121, Electrical Circuit Analysis

Time: 1 Hour

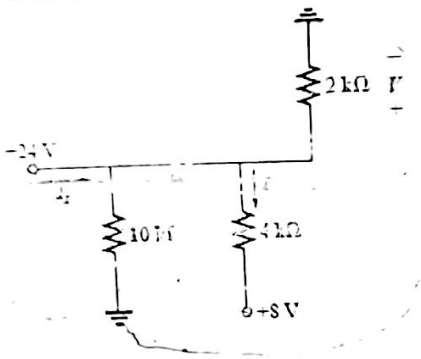
Total Marks: 35

1. a) State Kirchhoff's voltage law with a suitable figure. 3
   b) Determine the unknown voltages using Kirchhoff's voltage law. 3

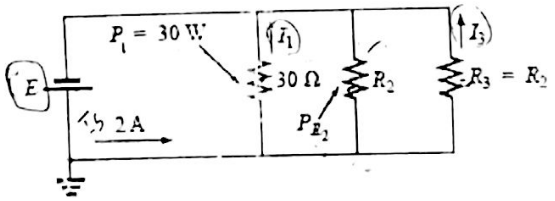


   c) The no-load and full-load voltages of a power supply are 120 V and 100 V respectively. Calculate the voltage regulation of the power supply. 2

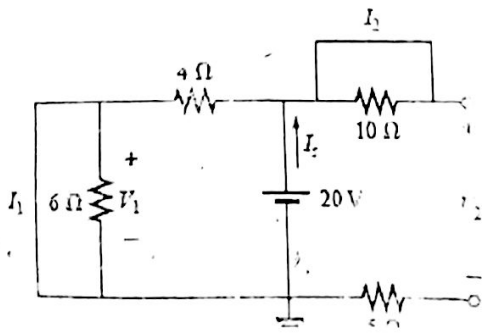
2. a) "For parallel resistors, the total resistance will always increase as additional elements are added in parallel". Do you agree? Give proof in favor of your opinion. 4
   b) For the network below 5
      i) Find the current I
      ii) Determine the voltage V
      iii) Calculate the source current I_s



3. a) What are the rules for dividing current in a parallel circuit? Also find the generic equation. 4
   b) Find the unknown quantities for the circuit using the information provided. 5



4. a) Define 'Open-circuit' and 'Short-circuit'. 4
   b) For the network below, determine 5
      i) The short-circuit currents I_1 and I_2
      ii) The voltages V_1 and V_2
      iii) The source current I_s



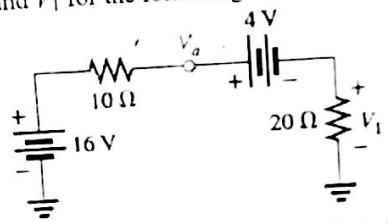
Department of Computer Science & Engineering, Dhaka University
First In-Course Examination
1st Year 1st Semester B.Sc., Session: 2013-2014
EEE – 1121, Electrical Circuit Analysis

Time: 1 Hour

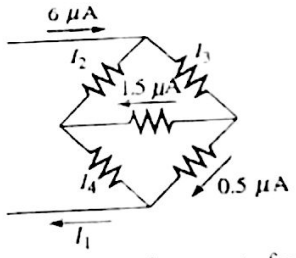
Total Marks: 35

1. Fill up the gaps:
   i) The total resistance of a series circuit is the sum of the resistance levels. This is true for _____ in a parallel circuit.
   ii) The application of Kirchhoff's voltage law need not follow a path that includes _____ elements.
   iii) The total resistance of parallel resistors is always less than the value of the _____ resistor.
   iv) If the smallest resistor of a parallel combination is much smaller than the other parallel resistors, the total resistance will be very _____ to the smallest resistor value.
   v) The total resistance of parallel resistors will always _____ as new resistors are added in parallel, irrespective of their value.
   vi) For any network (series or parallel) composed of resistive elements, the power applied by the battery will _____ that dissipated by the resistive elements.

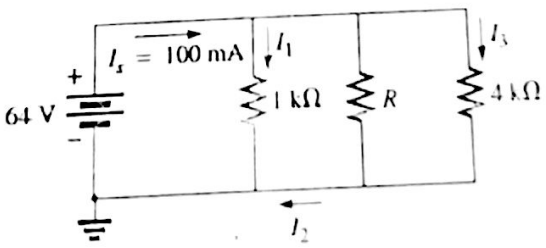
2. a) With suitable circuit diagram and using Kirchhoff's Voltage Law, derive the equation for internal resistance of a voltage source. What is voltage regulation?
   b) Determine the voltages V_a and V_1 for the following network:



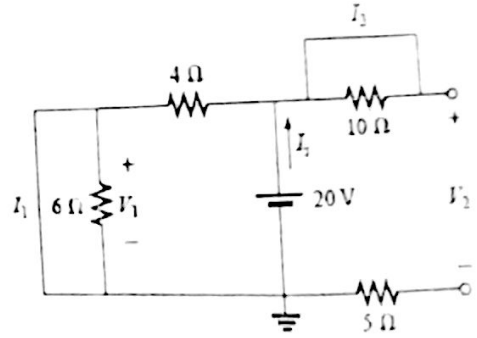
3. a) How can you increase the current rating to a load in a parallel circuit?
   b) Using Kirchhoff's current law, determine the unknown current for the following network:



4. a) Using the Current Divider Rule find the branch currents for two parallel resistors.
   b) Find the unknown quantities for the following network using the information provided.



5. a) Define 'Open-circuit' and 'Short-circuit'. Explain with figures.
   b) For the network below, determine
      i) The short-circuit currents I_1 and I_2
      ii) The voltages V_1 and V_2



   iii) The source current I_s

Department of Computer Science & Engineering, Dhaka University
Second In-Course Examination
1st Year 1st Semester B.Sc. (Honors), Session: 2013-2014
EEE – 1121, Electrical Circuit Analysis

Time: 1 Hour

Total Marks: 35

1. a) In what network arrangements, multiple voltage sources or current sources **cannot** appear in a series-parallel network? Explain based on their characteristics. 4
   b) How you can make a choice of **mesh analysis** or **nodal analysis** or both observing the network arrangements? Explain. 4

2. a) For the following network in **Figure: 1**, find V_1, V_2 and I_2. 4

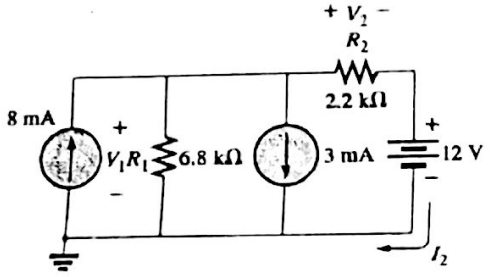


Figure: 1

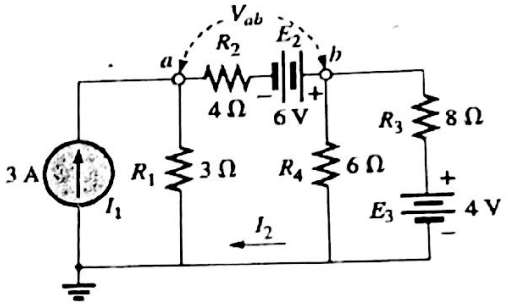


Figure: 2

   b) For the above network in **Figure 2**, find V_{ab} and I_2 using mesh and nodal analysis. Make necessary conversions to the network for analyzing and check your results. 7
   c) Find the current I for the following network in **Figure: 3**: 3

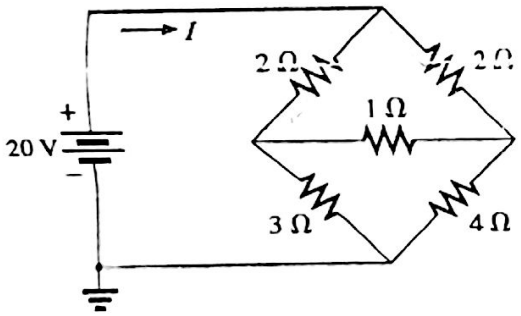


Figure: 3

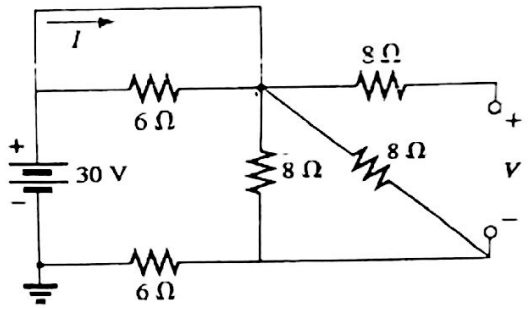


Figure: 4

3. a) Determine the voltage V and the current I for the above network in **Figure 4**. 4
   b) For the following network in **Figure 5**, determine the currents I_1, I_2, I_3 and voltage levels V_a and V_b. 5

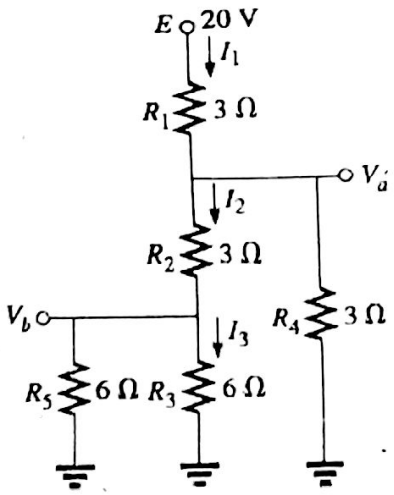


Figure: 5

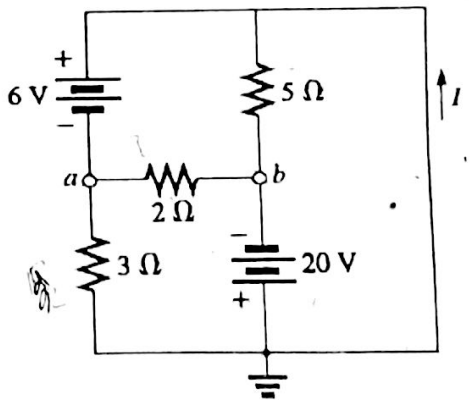


Figure: 6

   c) For the above network in **Figure 6**, calculate voltage V_{ab} and current I. 4

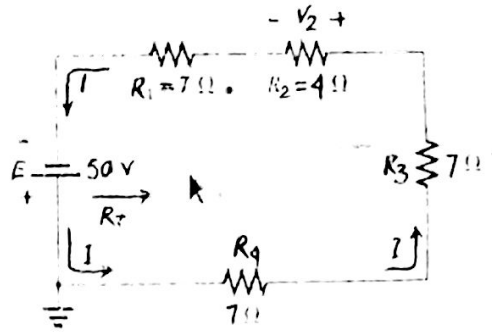
Department of Computer Science and Engineering

EEE-1121: Electrical Circuit Analysis

Total Marks: 60 **Time: 2.5 Hours**

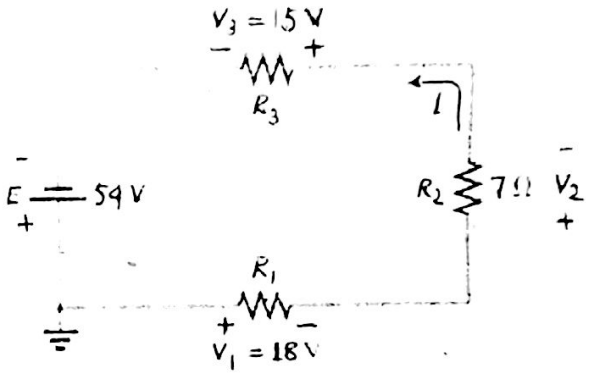
(Answer any Four (4) of the following Questions)

1. a) For the network shown in the figure: 6
i) Find the total resistance of the circuit.
ii) Calculate the current I.
iii) Calculate the voltage drops across R_1, R_2, R_3 and R_4

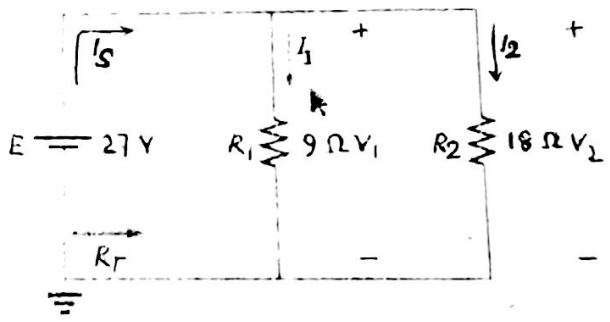


b) Explain the terms 'open circuit' and 'short circuit'. 4

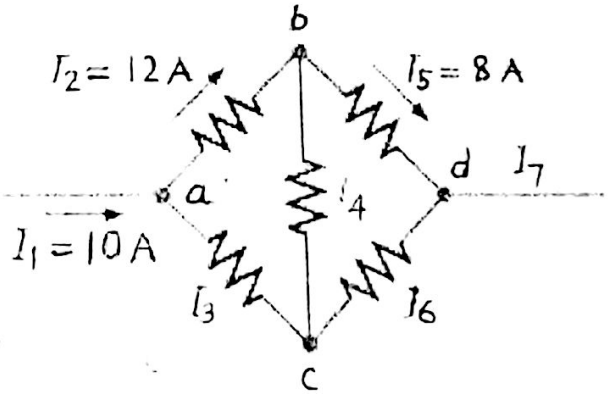
c) For the network shown in the figure: 5
i) Determine V_2 using Kirchhoff's voltage law.
ii) Determine I.
iii) Find R_1 and R_3.



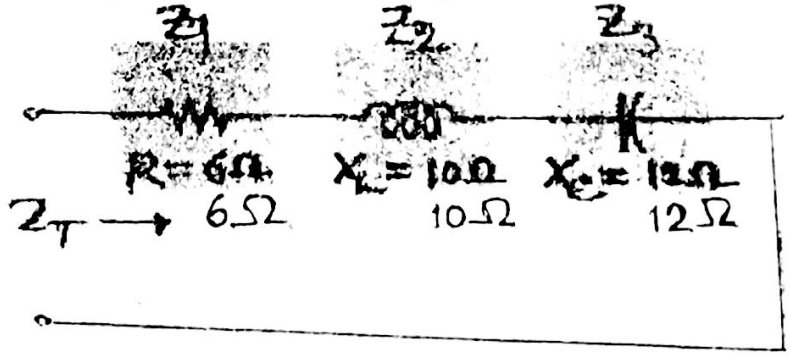
2. a) For the network shown in the figure: 6
i) Calculate the total resistance R_T
ii) Determine the source current I_S
iii) Prove that the source current is equal to the sum of the individual branch currents.



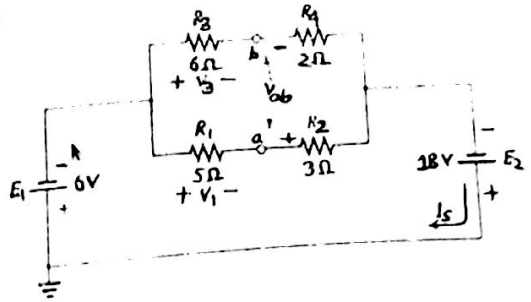
b) Describe Kirchhoff's current law. Find the magnitude and direction of the currents I_3, I_4, I_6, and I_7 for the network. 5



c) Determine the total impedance of the following series connection. 4



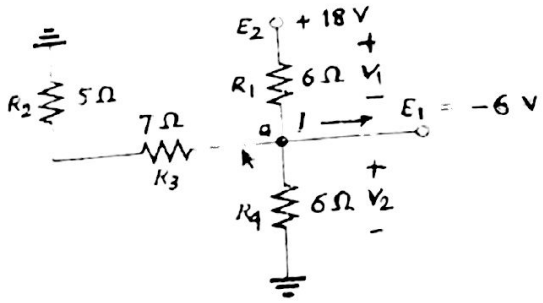
3 a) For the network shown in the figure, find the voltages V_1, V_2 and V_{ab}. Calculate the source current Is.



7.5

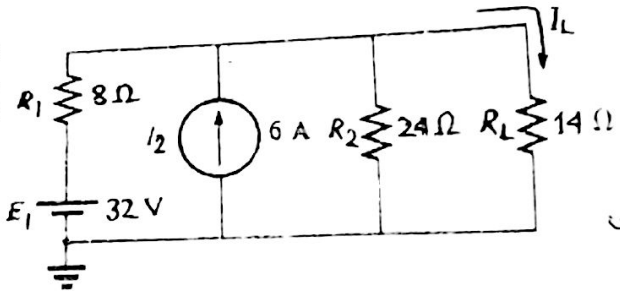
b) For the network shown in the figure, determine the voltages V_1 and V_2 and the current I.

7.5



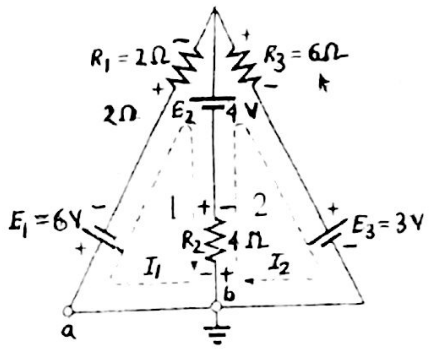
4. a) Reduce the network shown in the figure to a single current source, and calculate the current through R_L.

5



b) Using mesh analysis finds the branch currents of the network shown in the figure.

5



c) Describe the steps of nodal analysis (format approach).

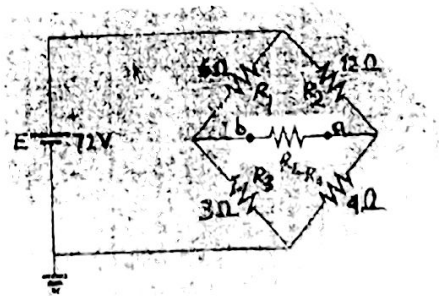
5

5. a) Describe the general steps for finding Thévenin equivalent circuit for sinusoidal ac circuits.

3

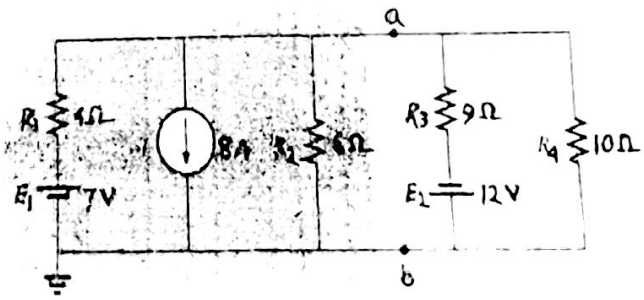
b) Find the Thévenin equivalent circuit for the network in the shaded area of the bridge network shown in the figure.

6

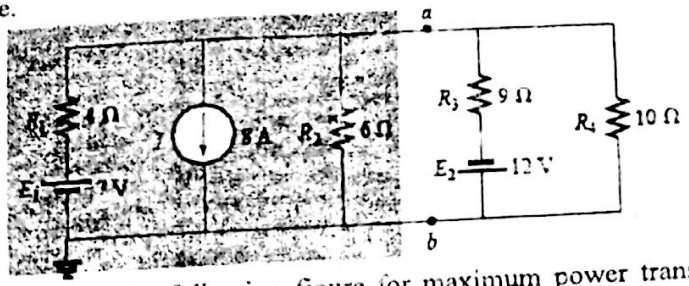


c) Find the Norton equivalent circuit for the portion of the network to the left of a-b shown in the figure.

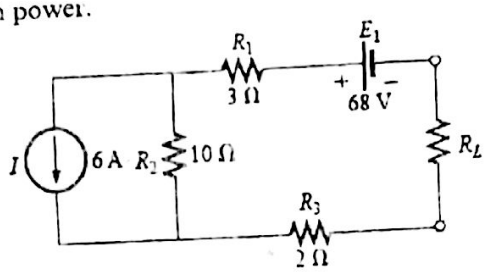
6



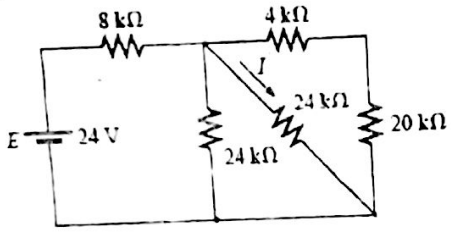
b) Find the Norton equivalent circuit for the portion of the network to the left of a-b in the following figure. 4



c) Find the value of R_L in the following figure for maximum power transfer to R_L, and determine the maximum power. 4

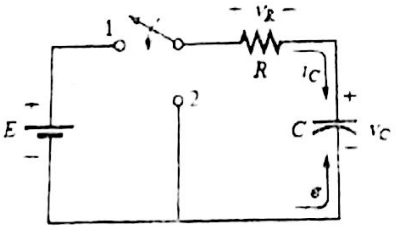


For the following network, determine the current I. Explain whether the reciprocity theorem is satisfied or not. 3

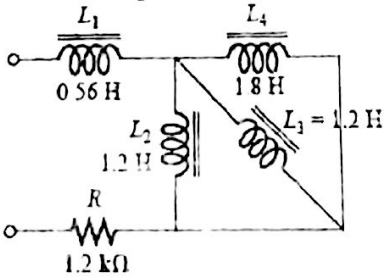


6. a) Define permittivity of the dielectric. Using this definition derive the equation of capacitance. 2+2

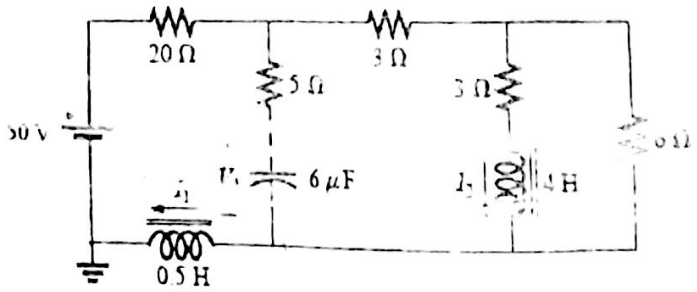
b) Derive the equation for time to reach a particular voltage or current during charging phase in a basic capacitive network. 4



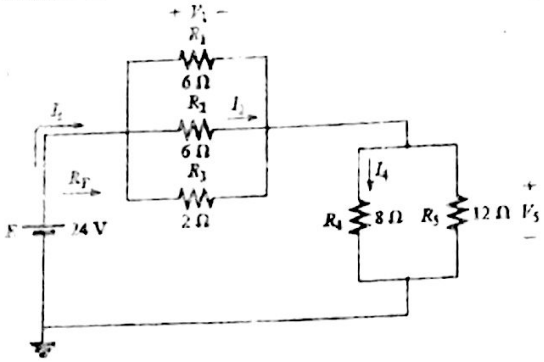
c) Reduce the following network to its simplest form. 3



d) Find the voltage V_1 and the current through each inductor in the following circuit. 4



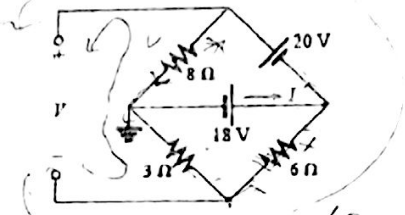
b) Find the indicated currents and voltages for the following network. 5



c) For the network of following figure: 5

i) Determine the current I

ii) Calculate the open-circuit voltage V.

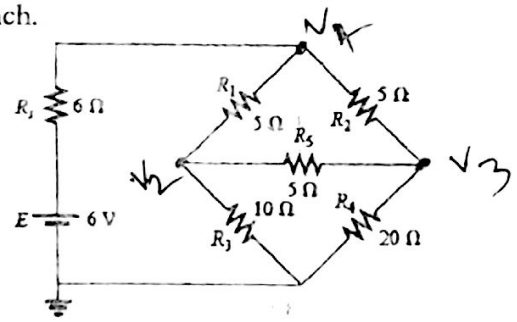


4 a) What is linear bilateral network? What are the differences between voltage source and current source? 1+2

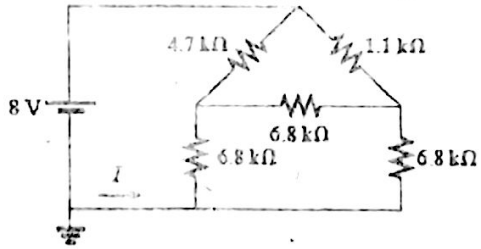
b) Consider the bridge network below: 4+4

i) Using mesh analysis, find the current in each branch.

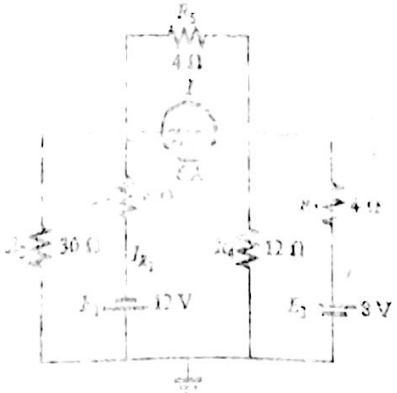
ii) Using nodal analysis, find the nodal equations for the network and also find the current in each branch.



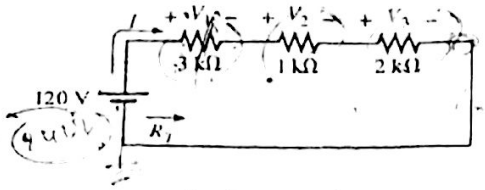
c) Using a Δ–Y conversion, find the current I in the following network. 4



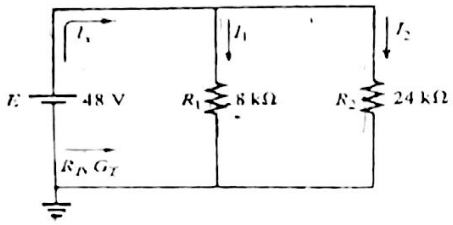
5 a) Using superposition theorem, find the current through R_1 for the following network. 4



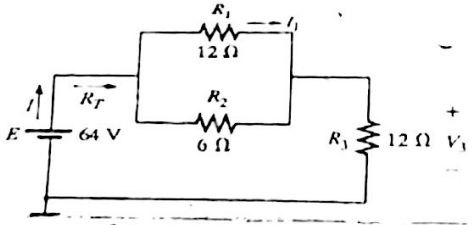
Department of Computer Science and Engineering
Incourse Examination
1st year 1st semester, 2012



1. For the above circuit:
   a) Find the total resistance, current, and unknown voltage drops.
   b) Verify Kirchhoff's voltage law around the closed loop.
   c) Find the power dissipated by each resistor, and note whether the power delivered is equal to the power dissipated.
   d) If the resistors are available with wattage ratings of 1/2, 1, and 2 W, what minimum wattage rating can be used for each resistor in this circuit?

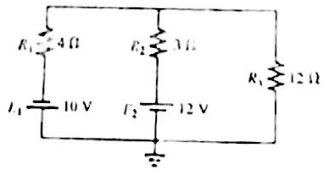


2. For the above network
   a) Find the total conductance and resistance.
   b) Determine Is and the current through each parallel branch.
   c) Verify that the source current equals the sum of the parallel branch currents.
   d) Find the power dissipated by each resistor, and note whether the power delivered is equal to the power dissipated.
   e) If the resistors are available with wattage ratings of 1/2, 1, 2, and 50 W, what is the minimum wattage rating for each resistor?

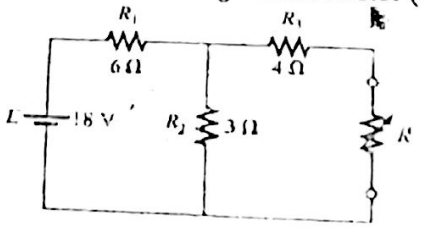


Department of Computer Science and Engineering, 1st year 1st semester, 2012

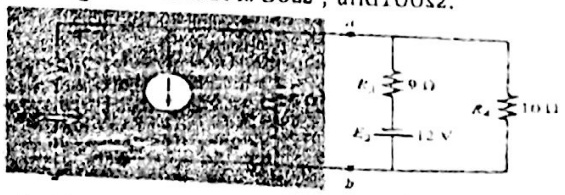
3. For the above network:
   a) Calculate R_T.
   b) Determine I and I_1.
   c) Find V_3.



1. For the above circuit, find the current through each resistor (using mesh analysis).



2. For the above network .
   a) Find the Thévenin equivalent circuit for the network external to the resistor R.
   b) Find the current through R when R is 30Ω , and100Ω.



3. For the above network: Find the N

4. a) For the following network in Fig. 4.1, find the branch currents using: 10

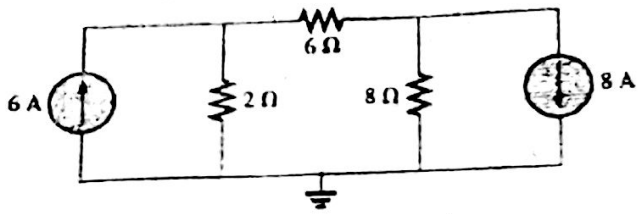


Fig. 4.1

i) Supermesh approach
ii) Source conversion
iii) Nodal analysis
iv) Superposition theorem

b) Consider the following network in Fig 4.2. 5

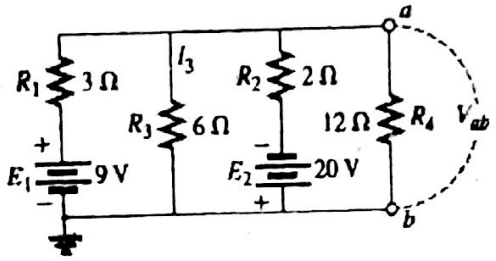


Fig. 4.2

i) Find the voltage V_{ab} and the polarity of points a and b.
ii) Find the magnitude and direction of the current I_3.

5. a) For the networks in Fig. 5.1, write the nodal equations and solve for the nodal voltages. 5

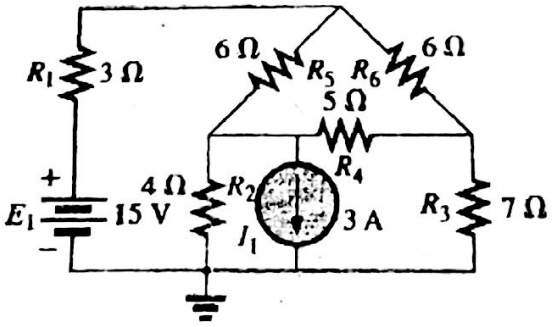


Fig. 5.1

b) Using a Δ-Y or Y-Δ conversion, find the current I in each of the networks in Fig. 5.2. 4

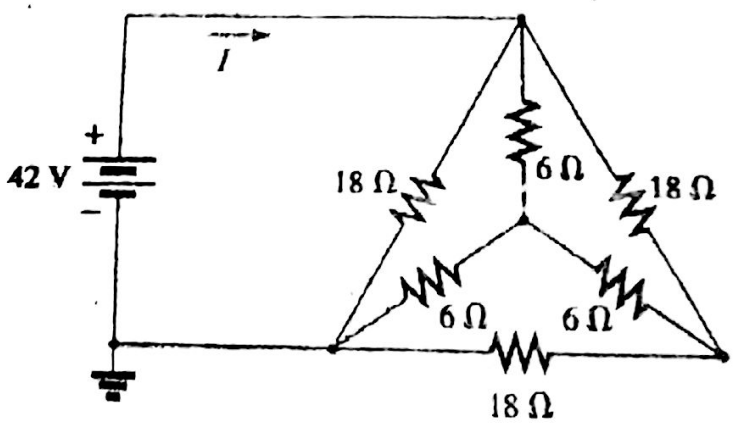


Fig. 5.2

c) State Thevenin's theorem with example. Find the Thevenin equivalent circuit for the portions of the networks in Fig. 5.3 external to points *a* and *b*.

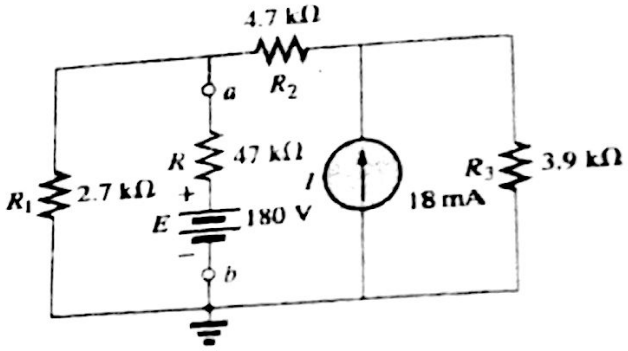


Fig. 5.2

6. a) i) Using superposition, find the current through R_1 for the network in Fig. 6.1 3+2
ii) Demonstrate that the superposition theorem is not applicable to power levels.

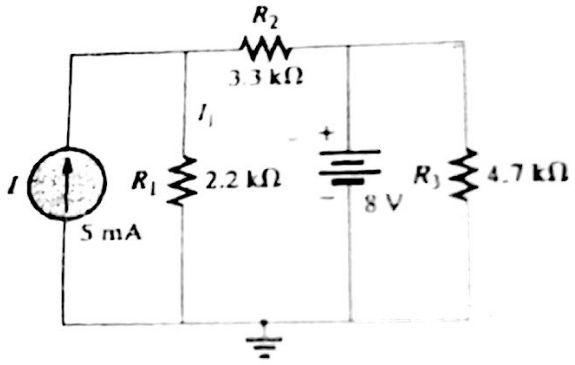


Fig. 6.1

b) State substitution theorem. Find the current through and voltage across the resistor R_L in Fig. 6.2. 2+3

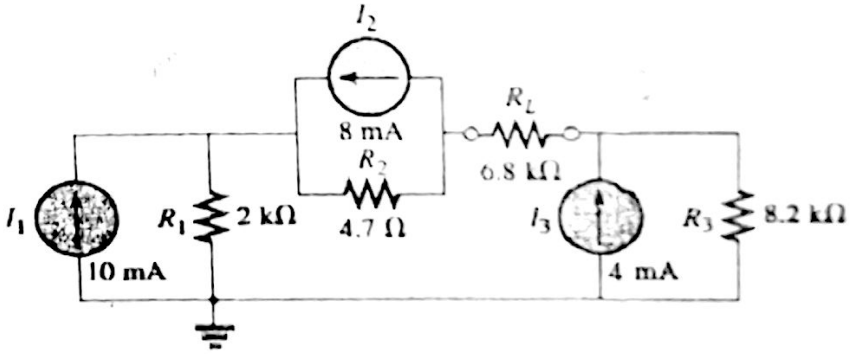


Fig. 6.2

c) What is the limitation of reciprocity theorem? Prove the reciprocity theorem for the network in Fig. 6.3. 1+4

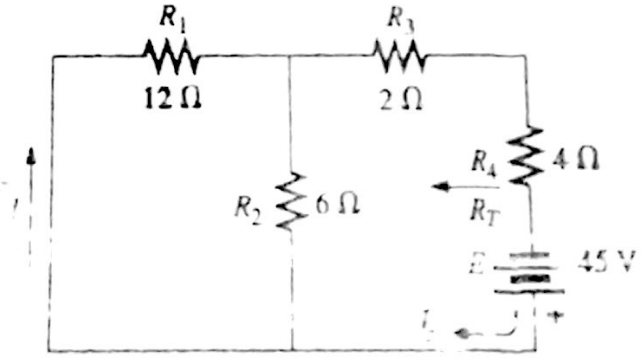


Fig. 6.3

EEE-1121 : Electrical Circuit Analysis

Time: 2.5 Hours

Total Marks: 60

[Answer any Four (4) of the following Questions]

1. a) How do you define a relationship between Ohm's Law and equation of a straight line? 4
   b) Find the unknown currents in the following network in Fig1.1. 4

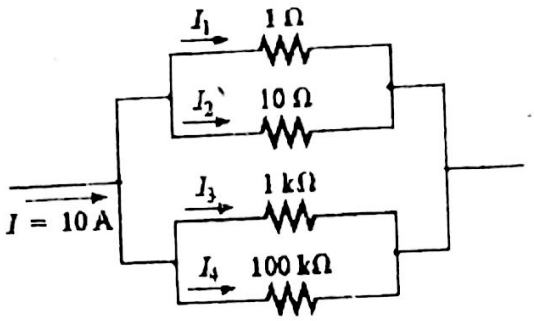


Fig. 1.1

   c) What is the resistance of a 100-ft long copper wire with a diameter of 0.020 inch at 20°C? 3
   d) Briefly describe the affects of temperature on conductor, semiconductor and insulator. 4

2. a) Using Kirchhoff's voltage law, find the unknown voltages for the configurations in Fig. 2.1. 3

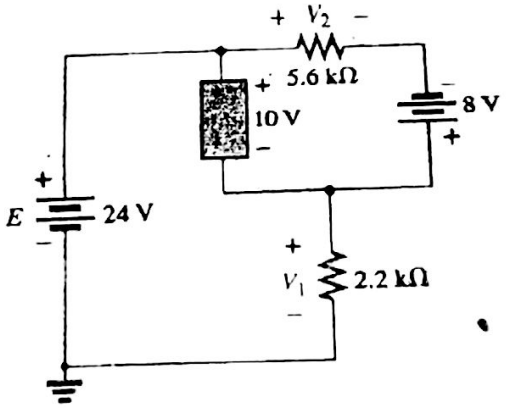


Fig. 2.1

   b) Referring to Fig 2.2
      i) Determine V_2 and V_3
      ii) Determine R_3

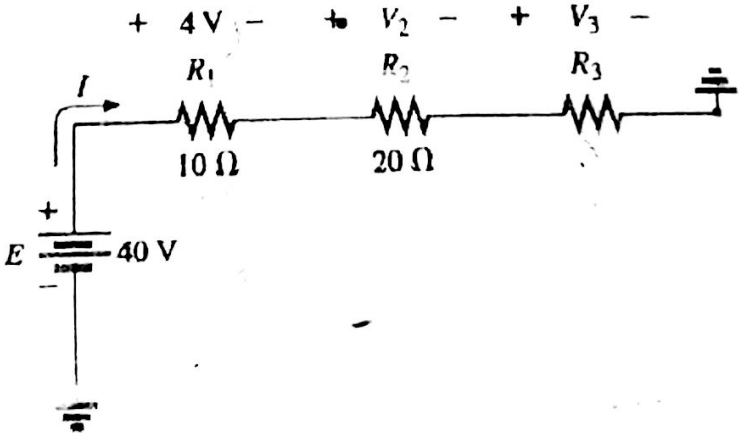


Fig. 2.2

   c) What is voltmeter's loading effect?
   d) Briefly explain open and short circuits.

c) Determine the values of R_1, R_2, R_3, and R_4 for the voltage divider of Fig. 2.3

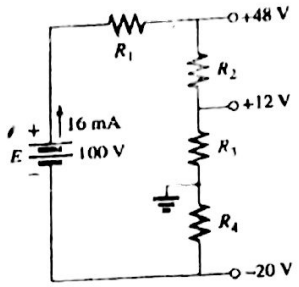


Fig. 2.3

3 5

3. a) For the network in Fig. 3.1:
   - i) Determine voltages V_a, V_b, and V_c.
   - ii) Find current I_2.
   - iii) Find the source current I_{S3}

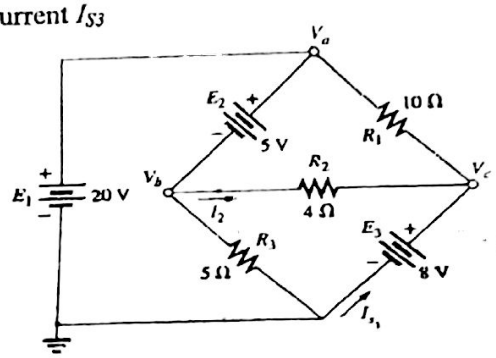


Fig. 3.1

b) Determine the dc levels for the transistor network of following Fig. 3.2 using the fact that V_{BE}= 0.7 V, V_E = 2 V, and $I_C = I_E$. That is: 7
   - i) Determine I_E and I_C.
   - ii) Calculate I_B.
   - iii) Determine V_B and V_C.
   - iv) Find V_{CE} and V_{BC}.

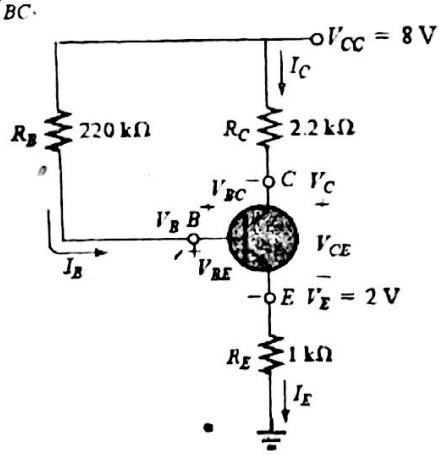
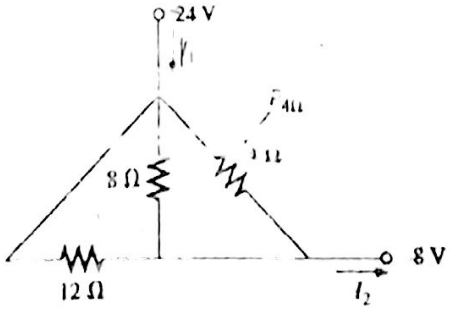
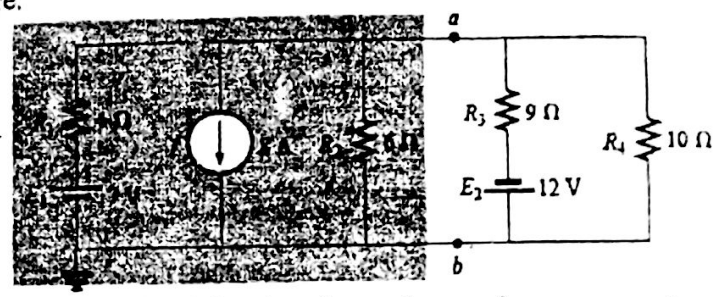


Fig. 3.2

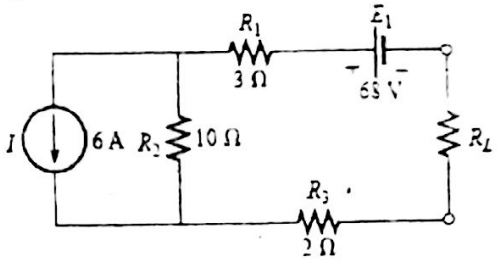
c) For the network in Fig. 3.3: 3
   - i) Find the current I_1.
   - ii) Calculate the power dissipated by the 4 Ω resistor.
   - iii) Find the current I_2.



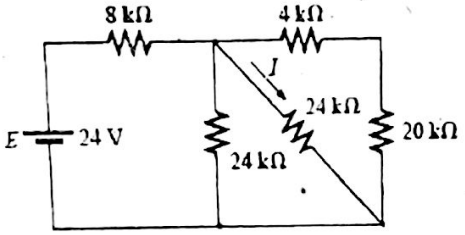
b) Find the Norton equivalent circuit for the portion of the network to the left of a-b in the following figure. 4



c) Find the value of R_L in the following figure for maximum power transfer to R_L, and determine the maximum power. 4



d) For the following network, determine the current I. Explain whether the reciprocity theorem is satisfied or not. 3



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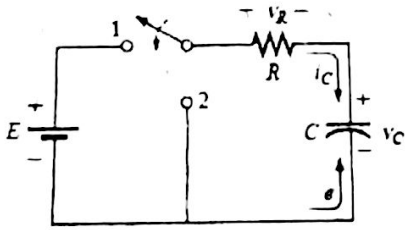
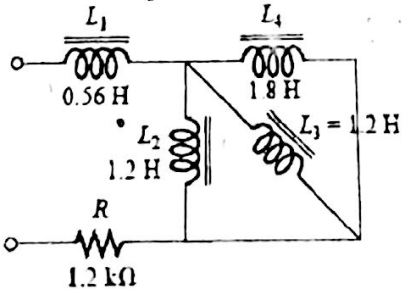
6. a) Define permittivity of the dielectric. Using this definition derive the equation of capacitance. 2+2

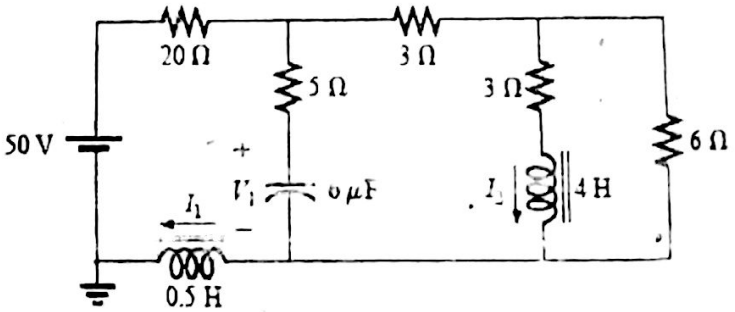
b) Derive the equation for time to reach a particular voltage or current during charging phase in a basic capacitive network. 4



c) Reduce the following network to its simplest form. 3



d) Find the voltage V_1 and the current through each inductor in the following circuit.



Total Marks: 60 **Time: 2.5 Hour**

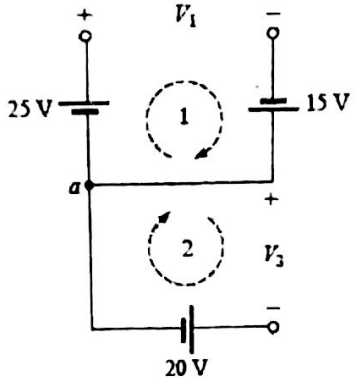
[Answer any Four (4) of the following Questions]

1. a) Define resistance of a material. Briefly describe the temperature effects on the resistance of conductor, semiconductor and insulator. 2+3

   b) Plot curves of Ohm's law for 5 Ω and 10 Ω resistors in a range of 0 to 30 V. Relate the curves with equations of a straight line and find the slope in both the cases. 3+2

   c) Define efficiency of a system. A 2-hp motor operates at an efficiency of 75%. What is the power input in watts? If the applied voltage is 220 V, what is the input current? 2+3

2. a) State Kirchhoff's voltage law with example. Find V_1 and V_2 for the following network. 2+2



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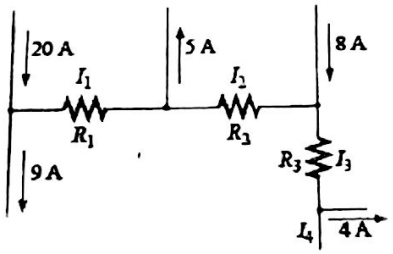
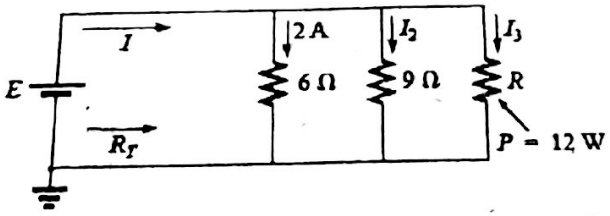
   b) State Kirchhoff's current with example. Find the unknown currents and their directions in the following circuit. 2+2



   c) Find the unknown quantities for the following circuit using the provided information. 4

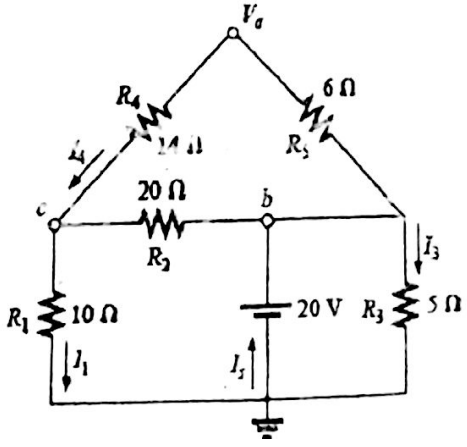


   d) What is the main characteristics regarding voltage and current of an open circuit and a short circuit? Explain with example. 3

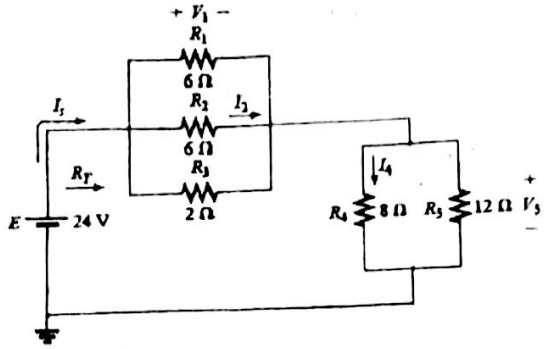
3. a) For the following network: 5

   i) Determine the currents I_S, I_1, I_3, I_4

   ii) Calculate V_a and V_{bc}



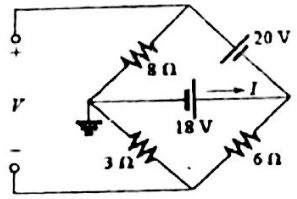
b) Find the indicated currents and voltages for the following network. 5



c) For the network of following figure: 5

i) Determine the current I

ii) Calculate the open-circuit voltage V.

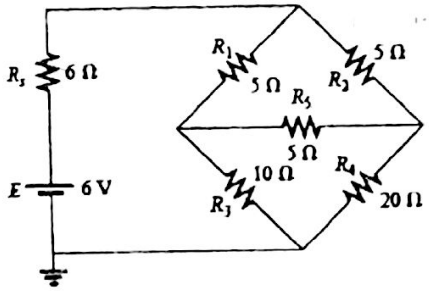


4. a) What is linear bilateral network? What are the differences between voltage source and current source? 1+2

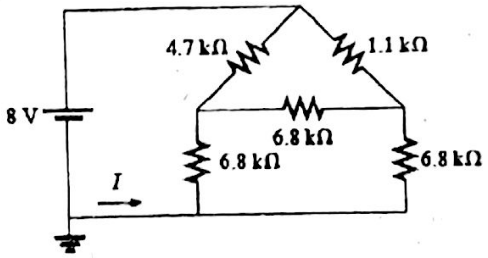
b) Consider the bridge network below: 4+4

i) Using mesh analysis, find the current in each branch.

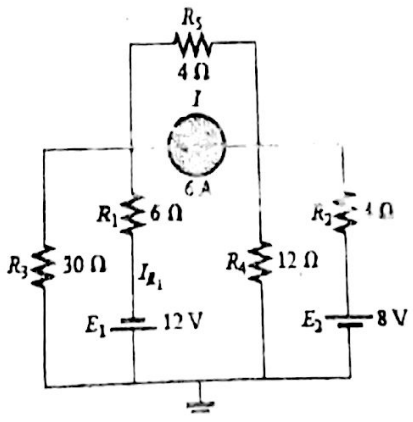
ii) Using nodal analysis, find the nodal equations for the network and also find the current in each branch.

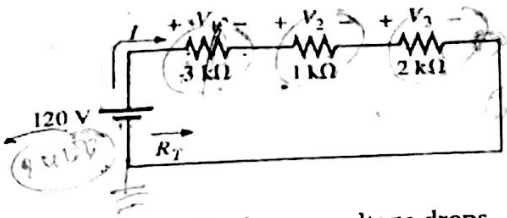


c) Using a Δ–Y conversion, find the current I in the following network. 4

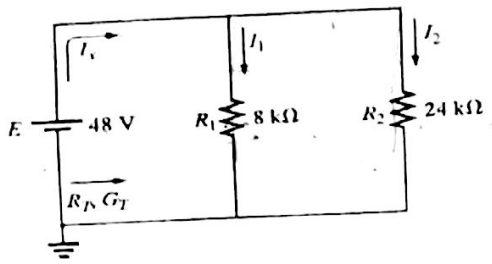


5. a) Using superposition theorem, find the current through R_1 for the following network. 4

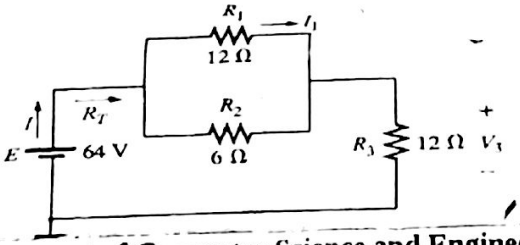




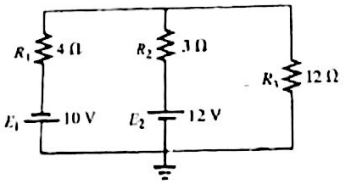
1. For the above circuit:
   a) Find the total resistance, current, and unknown voltage drops.
   b) Verify Kirchhoff's voltage law around the closed loop.
   c) Find the power dissipated by each resistor, and note whether the power delivered is equal to the power dissipated.
   d) If the resistors are available with wattage ratings of 1/2, 1, and 2 W, what minimum wattage rating can be used for each resistor in this circuit?



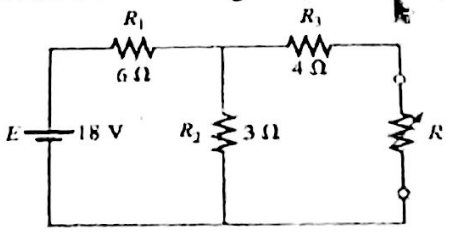
2. For the above network
   a) Find the total conductance and resistance.
   b) Determine Is and the current through each parallel branch.
   c) Verify that the source current equals the sum of the parallel branch currents.
   d) Find the power dissipated by each resistor, and note whether the power delivered is equal to the power dissipated.
   e) If the resistors are available with wattage ratings of 1/2, 1, 2, and 50 W, what is the minimum wattage rating for each resistor?



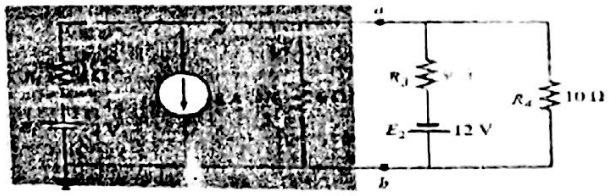
3. *For the above network:*
   a) Calculate R_T.
   b) Determine I and I_1.
   c) Find V_3.



1. For the above circuit, find the current through each resistor (using mesh analysis).



2. For the above network
   a) Find the Thévenin equivalent circuit for the network external to the resistor R.
   b) Find the current through R when R is 30Ω , and100Ω.



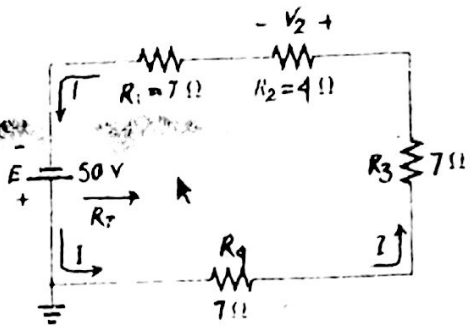
3. For the above network: Find the Norton equivalent circuit for the portion of the network to the left of a-b

Department of Computer Science and Engineering
EEE-1121: Electrical Circuit Analysis

Total Marks: 60 **Time: 2.5 Hours**

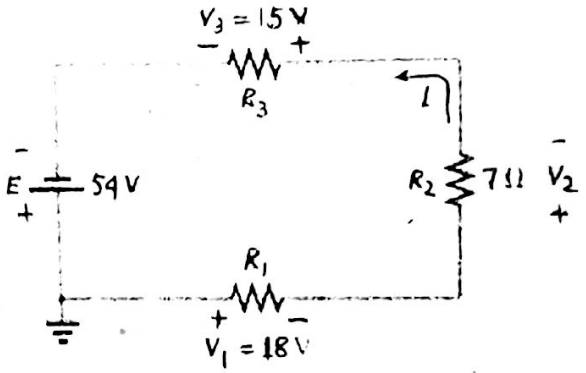
(Answer any Four (4) of the following Questions)

1. a) For the network shown in the figure: 6
   i) Find the total resistance of the circuit.
   ii) Calculate the current I.
   iii) Calculate the voltage drops across R_1, R_2, R_3 and R_4

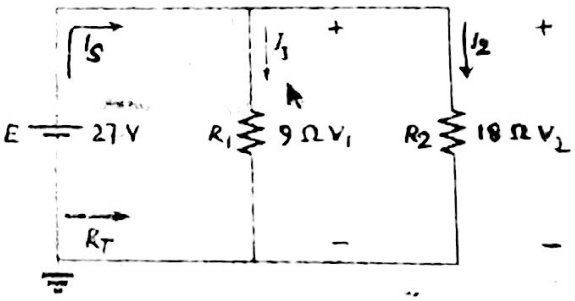


   b) Explain the terms 'open circuit' and 'short circuit'. 4

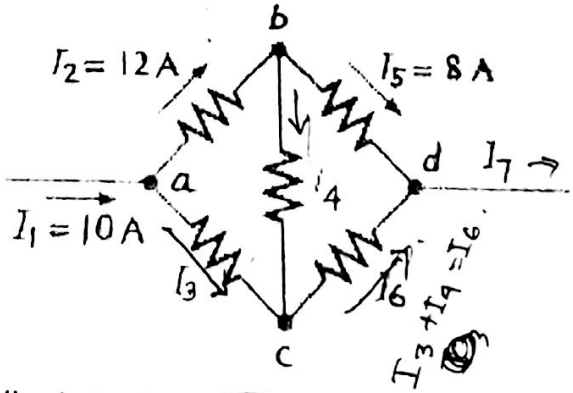
   c) For the network shown in the figure: 5
   i) Determine V_2 using Kirchhoff's voltage law.
   ii) Determine I.
   iii) Find R_1 and R_4.



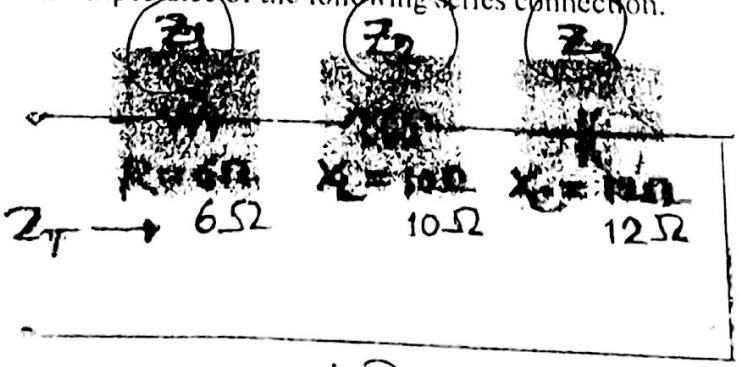
2. a) For the network shown in the figure: 6
   i) Calculate the total resistance R_T
   ii) Determine the source current I_S
   iii) Prove that the source current is equal to the sum of the individual branch currents.



   b) Describe Kirchhoff's current law. Find the magnitude and direction of the currents I_3, I_4, I_6, and I_7 for the network. 5

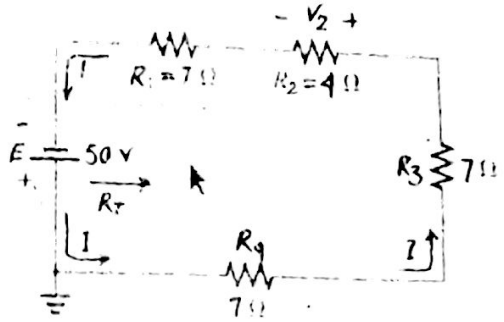


   c) Determine the total impedance of the following series connection.



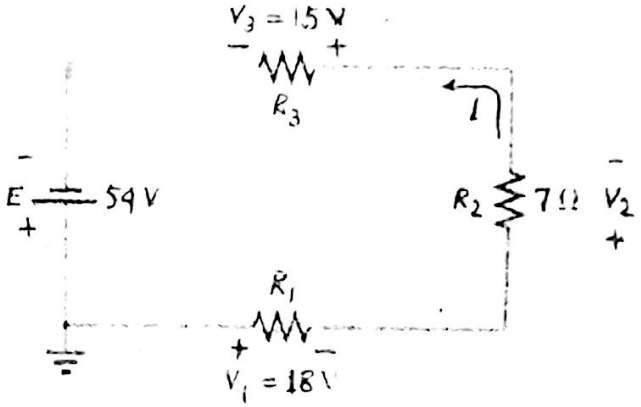
(Answer any Four (4) of the following Questions)

1. a) For the network shown in the figure: 6
   i) Find the total resistance of the circuit
   ii) Calculate the current I.
   iii) Calculate the voltage drops across R_1, R_2, R_3 and R_4

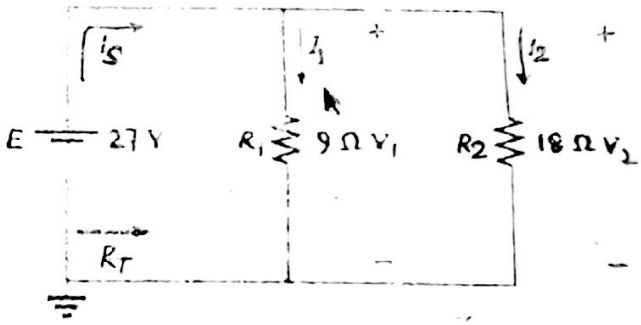


b) Explain the terms 'open circuit' and 'short circuit'. 4

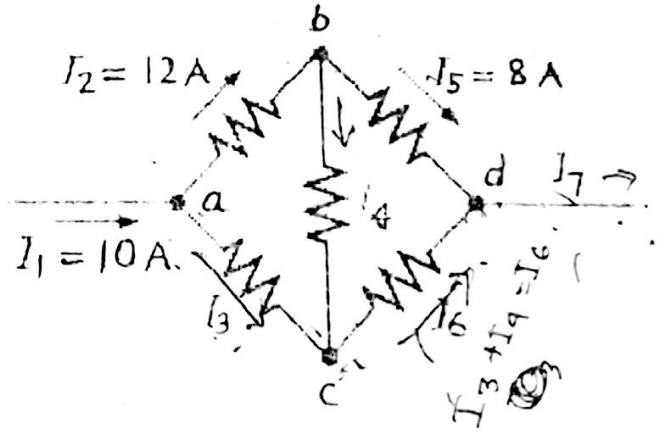
c) For the network shown in the figure 5
   i) Determine V_2 using Kirchhoff's voltage law.
   ii) Determine I.
   iii) Find R_1 and R_3



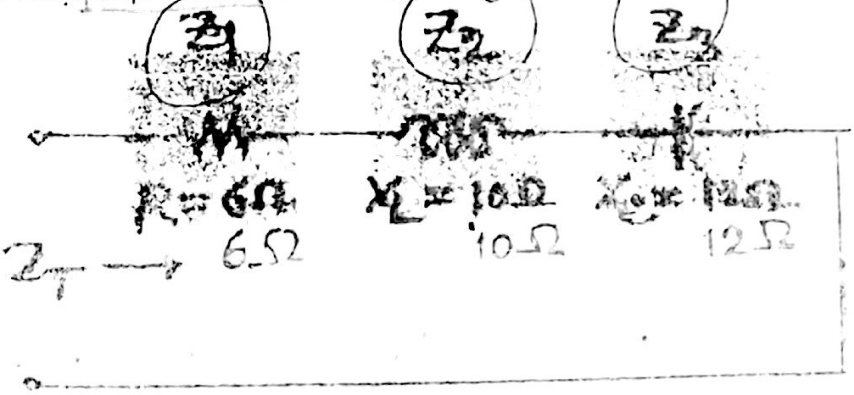
2. a) For the network shown in the figure: 6
   i) Calculate the total resistance R_T
   ii) Determine the source current I_S
   iii) Prove that the source current is equal to the sum of the individual branch currents.



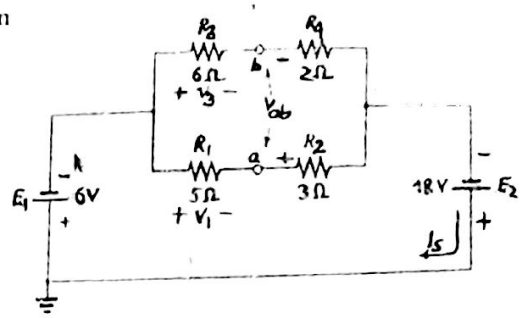
b) Describe Kirchhoff's current law. Find the magnitude and direction of the currents I_3, I_4, I_6, and I_7 for the network. 5



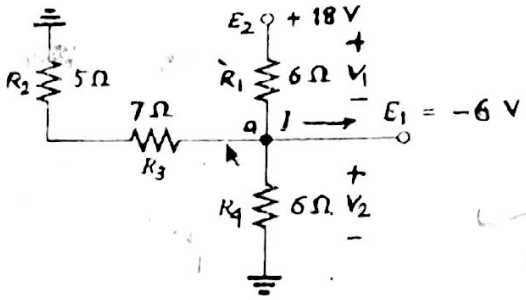
c) Determine the total impedance of the following series connection. 4



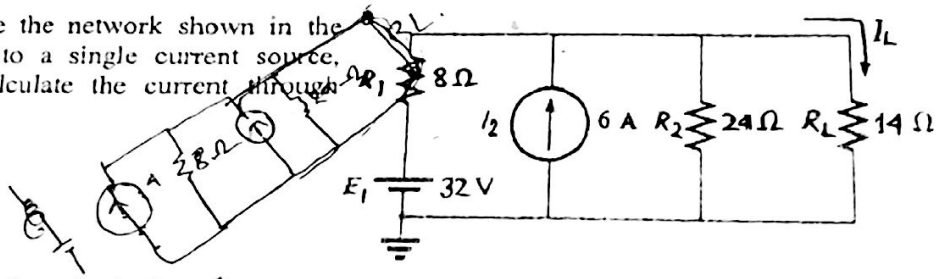
3. a) For the series-parallel network shown in the figure:
i) Find the voltages V_1, V_3, and V_{ab}.
ii) Calculate the source current I_S. 7.5



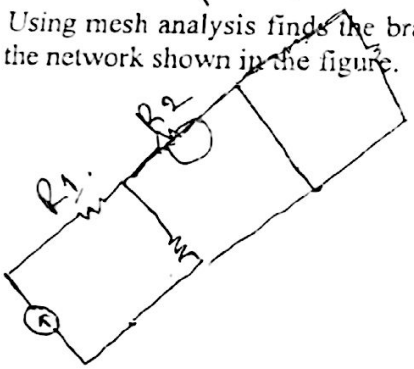
b) For the network shown in the figure, determine the voltages V_1 and V_2 and the current I. 7.5

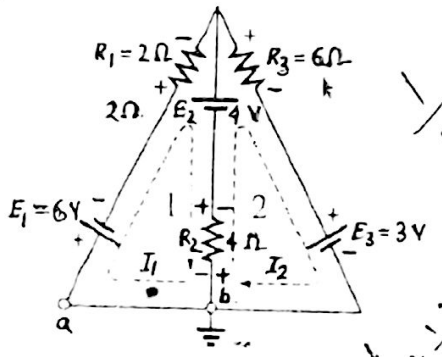


4. a) Reduce the network shown in the figure to a single current source, and calculate the current through R_L. 5



b) Using mesh analysis finds the branch currents of the network shown in the figure. 5

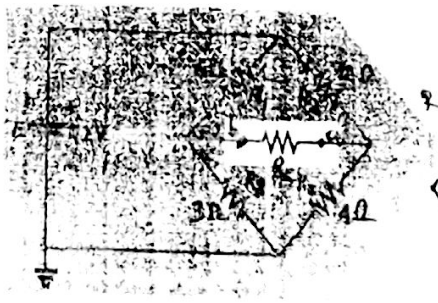




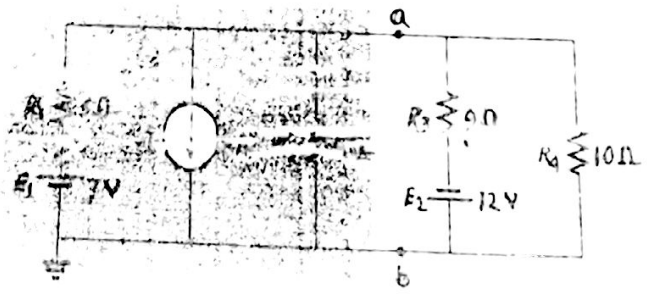
c) Describe the steps of nodal analysis (format approach) 5

5. a) Describe the general steps for finding Thévenin equivalent circuit for sinusoidal ac circuits. 3

b) Find the Thévenin equivalent circuit for the network in the shaded area of the bridge network shown in the figure. 6



c) Find the Norton equivalent circuit for the portion of the network to the left of a-b shown in the figure. 6



Department of Computer Science & Engineering, University of Dhaka

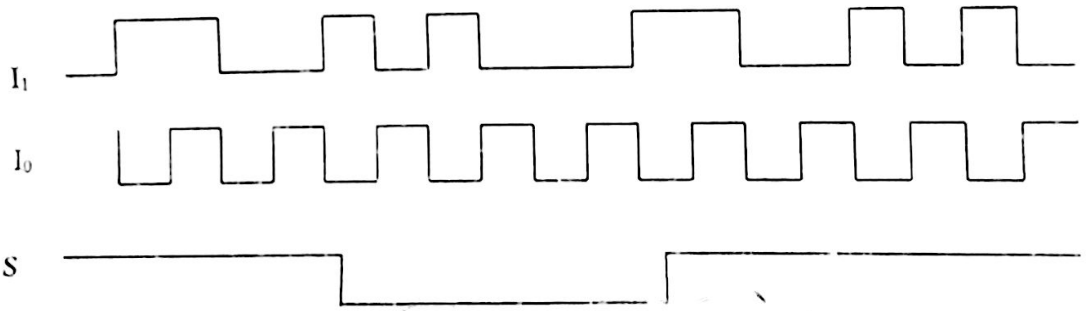
Incourse - 2

EEE – 1221 Digital Systems

Marks – 30 Time – 1 hour

Attempt all questions:

1. Construct a Full Subtractor using two Half Subtractors.
2. For each item, indicate whether it is referring to a decoder, an encoder, a MUX, or a DEMUX.
   (a) Has more inputs than outputs.
   (b) Uses SELECT inputs.
   (c) Can be used to generate arbitrary logic functions.
   (d) Produces a binary code at its output.
3. Construct a Full Adder using only NAND gates.
4. Draw a synchronous, MOD-16, up/down counter. The count direction is controlled by *dir* (*dir* = 0 to count up).
5. Show how an edge-triggered D FF can be made to operate in the toggle mode?
6. A binary counter is being pulsed by a 256 KHz clock signal. The output frequency from the last FF is 2 KHz.
   i) Determine the MOD number.
   ii) Determine the counting range.
7. The following timing diagram is applied to a 2-input multiplexer. Draw the output waveform Z.



8. Construct a 5 × 32 decoder with four 3 × 8 decoders and a 2 × 4 decoder. Use a block diagram construction.

Department of Computer ...

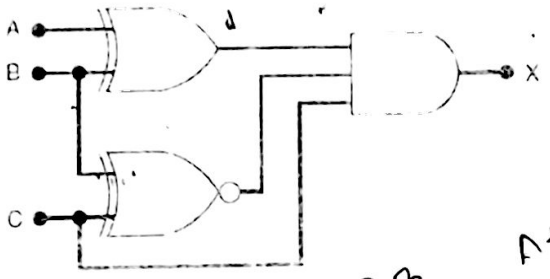
Incourse - 3

EEE – 1221 Digital Systems

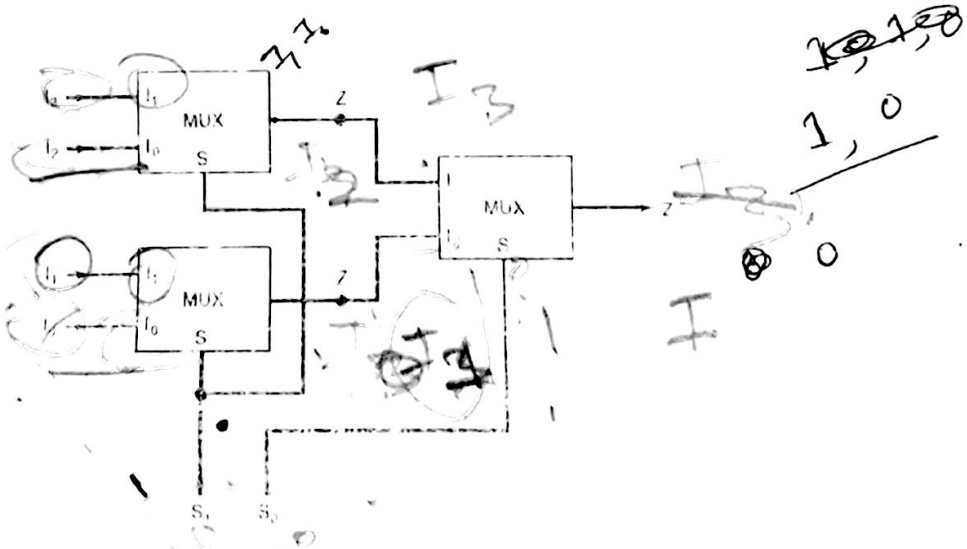
Marks – 30 Time – 1 hour

Attempt all questions:

1. Determine the input conditions needed to produce x = 1 for the following circuit:



2. Construct a XNOR gate use only XOR gates.
3. Design a logic circuit whose output is HIGH whenever A and B are both HIGH as long as C and D are either both LOW or both HIGH.
4. Subtract 14 from 23 in the 2's-complement system. Verify your result.
5. Construct a Full Subtractor circuit using two Half Subtractors.
6. The circuit of the following figure uses three two-input multiplexers. Determine the functions performed by this circuit.

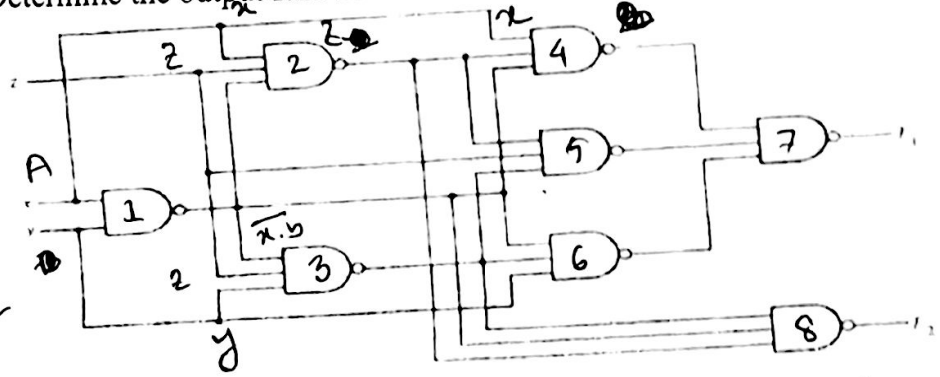


7. For a 74ALS138 (1-of-8 decoder) what input conditions will produce LOW at O_6?
8. Construct a 4 × 16 decoder using only 2 × 4 decoders. Use a block diagram construction.

Department of Computer Science & Engineering, University of Dhaka
Incourse - 1
EEE – 1221 Digital Systems
Marks – 30 Time – 1 hour

Attempt all questions:

1. Show the bit configuration that represents the decimal number 415 in
   (a) binary
   (b) BCD
   (c) ASCII
   (d) ASCII with even parity.
   Hint: The ASCII code of zero (0) is 30_{16}.
2. Convert the following numbers as indicated:
   (a) $(BC64)_{16} = (\ )_{10} = (\ )_2$
   (b) $(111011)_2 = (\ )_5$
3. Determine the output functions of the following logic circuit:



4. Optimize the Boolean expression $F = AB\bar{C}D + AC\bar{D} + A\bar{B}C + \bar{C}D$ using K-map.
5. The Boolean expressions of the two variables X and Y in terms of the three inputs A, B and C are given by

$$X = ABC + \bar{A}B\bar{C} + A\bar{B}\bar{C}$$
$$Y = (\bar{A} + \bar{B} + \bar{C})(\bar{A} + B + C)(A + \bar{B} + C)$$

   What is the relationship between X and Y?
6. Convert each of the following functions into SOP and POS form:
   (a) $(AB + C)(B + \bar{C}D)$
   (b) $\bar{X} + X(X + \bar{Y})(Y + \bar{Z})$
7. Design a combinational logic circuit with three input variables that will produce logic 1 output when more than one input variables are logic 0.
8. Show that the dual of the Exclusive-OR is equal to its complement.
   [Hint: Boolean duals are generated by simply replacing ANDs with ORs and ORs with ANDs.]
9. Show how to implement AND with OR and NOT gates.