Bangabandhu Sheikh Mujibur Rahman Science and Technology University
**Department of Computer Science and Engineering**
1st Year 1st Semester B.Sc. Engineering Examination-2014
Course No: EEE-104          Course Title: Electrical Circuit Analysis
Total marks: 70                                              Time: 3 hours.

N.B.
  i.    Answer **SIX** questions, taking any **THREE** from each section.
  ii.   All questions are of equal values
  iii.  Use separate answer script for each section

## SECTION - A

1.  (a)  What do you mean by 1A current and potential difference of 1V?                                                     1

    (b)  What are the factors that affecting the resistance of a conductor?                                                 $2\frac{2}{3}$

    (c)  Using Kirchhoff's voltage law, determine voltage $V_1$ and $V_2$ for the following network.                       4
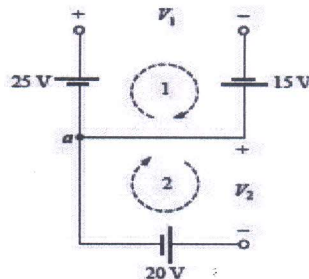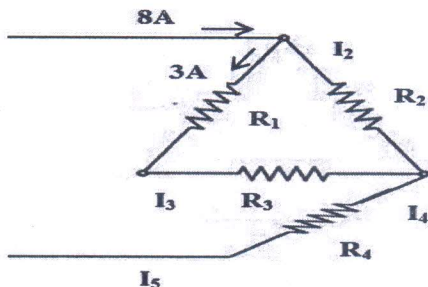


    (d)  Calculate the equivalent resistance $R_{ab}$ in the circuit shown below:                                           4
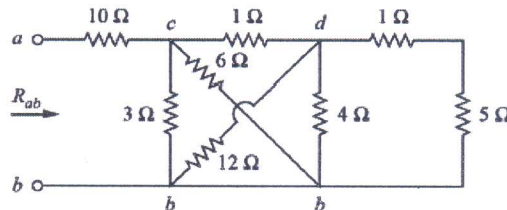


2.  (a)  Given the information provided in the following figure. Determine $R_3$, applied voltage E, source     $4\frac{2}{3}$
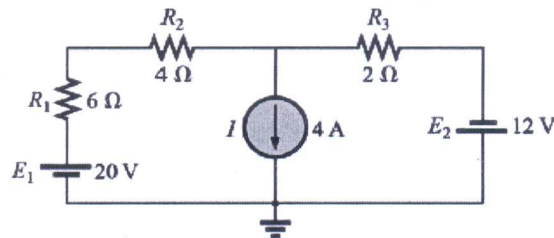         current $I_s$ and current $I_2$.
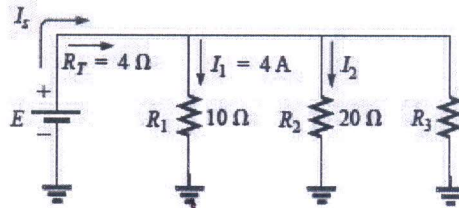


    (b)  Using the Kirchhoff's current law, determine the unknown current for the network given below:                      3
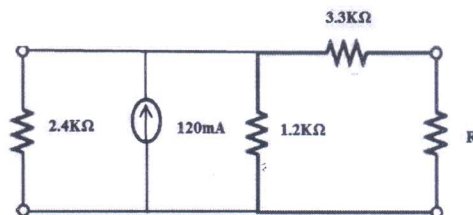
(c)     For the network of figure given below, determine the value of R for maximum power to R, and    4
        calculate the power delivered under these conditions.
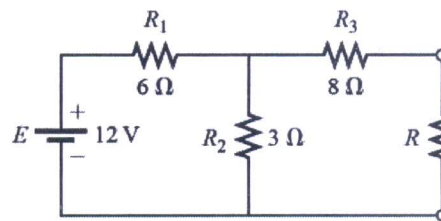


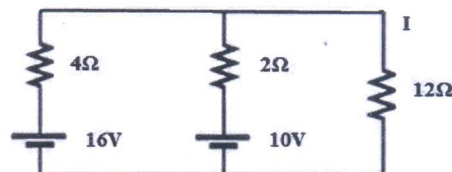3.  (a)  Using mesh analysis, determine the currents of the network given below:    4



    (b)  Find the thevenin equivalent circuit for the network external to the resistor R for the network in given    $3\frac{2}{3}$
         figure below:



    (c)  Using the superposition theorem, determine the current through the 12Ω resistor of the following    4
         figure:



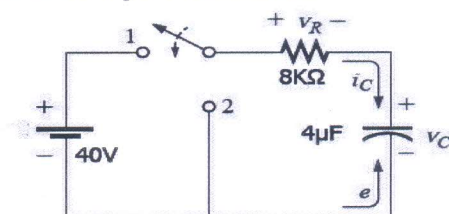4.  (a)  Using a Δ–Y or Y-Δ conversion, find the current I for the network of the figure shown below:    4
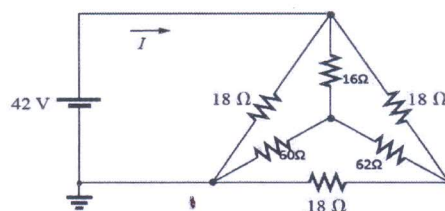


    (b)  Show that each resistor in the "T" network is the product of the resistors in the two adjacent    $5\frac{2}{3}$
         "π" branches, divided by the sum of the three "π" resistors.
    (c)  Give the statement of maximum power transfer theorem with necessary diagram.    2
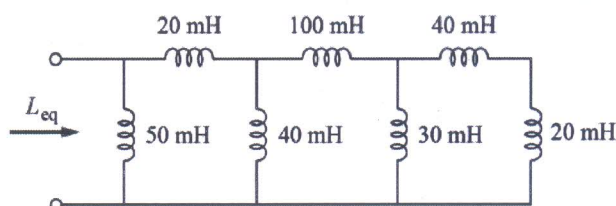

### SECTION-B

5.  (a)  Do you think capacitors have the effect on time constant on the response? Justify your answer.    $4\frac{2}{3}$

(b)   For the circuit in the following figure:                                                                7
        i.   Find the expression for the transient behavior of $V_c$, $I_c$ and $V_R$ of position 1 and 2
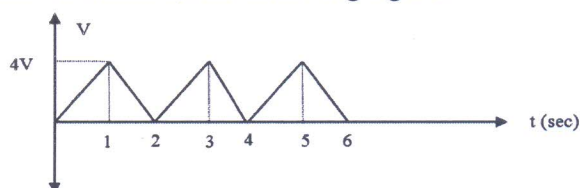        ii.  Also plot each waveforms at both position 1 and 2



6.  (a)   Calculate the equivalent inductance for the inductive ladder network in figure given below:       $3\frac{2}{3}$



    (b)   If $v$ = 100 sin($wt$ - 30°) and $i$ = 10 sin(wt - 60). What is the angle of phase different between current   3
          and voltage wave? Which wave lead? Show with neat sketch.
    (c)   For the following figure, find the expression of voltage, current and powers with neat sketch.        5



7.  (a)   Given that $v(t)$ = 120 cos(377t + 45°) and $i(t)$ = 10 cos(377t - 10°). Find instantaneous power and   $3\frac{2}{3}$
          average power.
    (b)   Find the rms value of current waveform of the following figure:                                       5



    (c)   A series connected load draws a current $i(t)$ = 4 cos(100πt + 10°) when the applied voltage is $v(t)$ =   3
          120 cos(100πt - 20°). Find the apparent power and the power factor of the load. Determine the
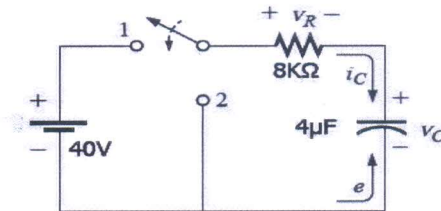          element values that form the series connected load.

8.  (a)   What do you mean by filter? Explain different types of filters.                                       $3\frac{2}{3}$

    (b)   Draw the circuit diagram of low pass and high pass filter. How can you design a band pass filter from   5
          low pass and high pass filter?
    (c)   What are the main parts of a CRT oscilloscope? Also draw the internal structure of it.                 3
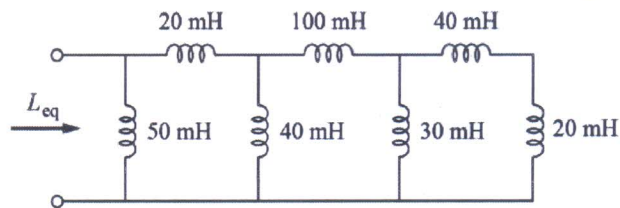
(b) For the circuit in the following figure:
   i. Find the expression for the transient behavior of $V_c$, $I_c$ and $V_R$ of position 1 and 2
   ii. Also plot each waveforms at both position 1 and 2

7
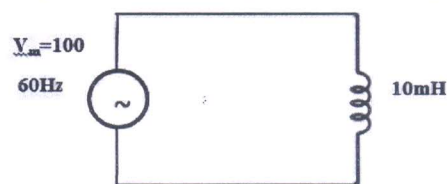


6. (a) Calculate the equivalent inductance for the inductive ladder network in figure given below: $3\frac{2}{3}$



(b) If $v = 100 \sin(wt - 30°)$ and $i = 10 \sin(wt - 60)$. What is the angle of phase different between current and voltage wave? Which wave lead? Show with neat sketch. 3

(c) For the following figure, find the expression of voltage, current and powers with neat sketch. 5



7. (a) Given that $v(t) = 120 \cos(377t + 45°)$ and $i(t) = 10 \cos(377t - 10°)$. Find instantaneous power and average power. $3\frac{2}{3}$

(b) Find the rms value of current waveform of the following figure: 5
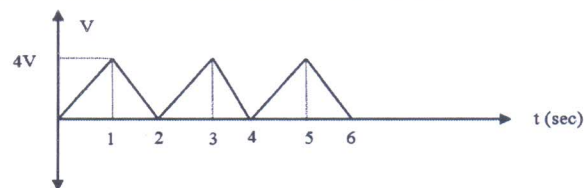


(c) A series connected load draws a current $i(t) = 4 \cos(100\pi t + 10°)$ when the applied voltage is $v(t) = 120 \cos(100\pi t - 20°)$. Find the apparent power and the power factor of the load. Determine the element values that form the series connected load. 3

8. (a) What do you mean by filter? Explain different types of filters. $3\frac{2}{3}$

(b) Draw the circuit diagram of low pass and high pass filter. How can you design a band pass filter from low pass and high pass filter? 5

(c) What are the main parts of a CRT oscilloscope? Also draw the internal structure of it. 3