Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Science and Technology
300 Level 1st Semester Examination – June/July 2017
SCT 362-2 Principles of Electricity

Uva Wellassa University

Instructions to candidates:
Duration: 2 Hours.
Number of questions: 04
Answer All Questions.
Mark allocation: 100 marks

1.

a. Briefly explain what are known as active circuit elements and passive circuit elements. Also give two examples for each category.

(8 marks)

b. Explain the difference between AC and DC.

(5 marks)

c. A sinusoidal waveform has an equation of the form,

$$V(t) = 10\sin(5t + 6)$$

Where all the constants are in the SI units ($10\ V, 5\ rad\ s^{-1}, 6\ rad$).

i. What is the peak value of the signal?

(2 marks)

ii. Briefly explain why the mean value of the waveform is zero.

(5 marks)

iii. Calculate the instantaneous value of the waveform when, $t = 5\ s$.

(5 marks)

2.

a. What is meant by a bilateral network?

(5 marks)

b. Find the Thevenin's equivalent circuit and Norton's equivalent circuit for the circuit given in figure 01.

(20 marks)

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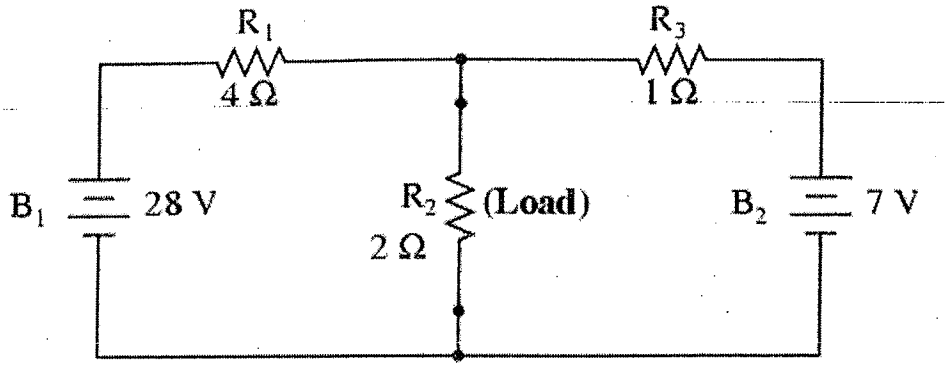

Figure 01

3.

a. State the maximum power transfer theorem.

(5 marks)

b. Consider the circuit shown in figure 02.

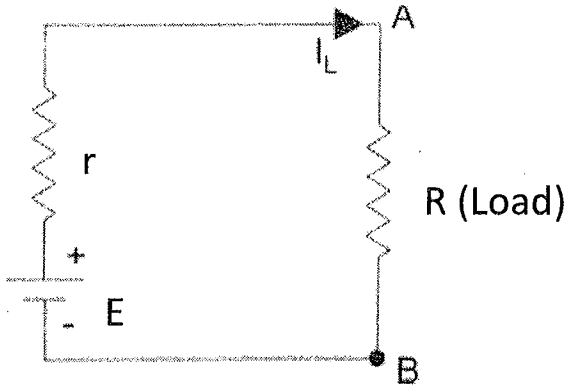

Figure 02

i. If the voltage output and internal resistance of the source is E and r respectively, then find the expression for the current through the load resistor (R).

(5 marks)

ii. Show that power dissipated by the load resistor is $P = \left(\frac{E}{r+R}\right)^2 R$.

(5 marks)

iii. Show that when $R = r$, the power dissipated through the load resistor is maximum. (You may use $\frac{dP}{dR} = 0$ when power is maximum)

(10 marks)

4.

a. Explain what is known as the transient state of a circuit.

(5 marks)

b. Laplace transform of a time function $f(t)$ is defined as,

$$\mathcal{L}[f(t)] = f(s) = \int_0^\infty f(t)\, e^{-st}\, dt$$

i. Show that the Laplace transform of the exponential decay function ($f(t) = e^{-at}$) is equal to $\frac{1}{s+a}$.

(8 marks)

ii. Find the Laplace transform of the wave function given in figure 03.

(12 marks)

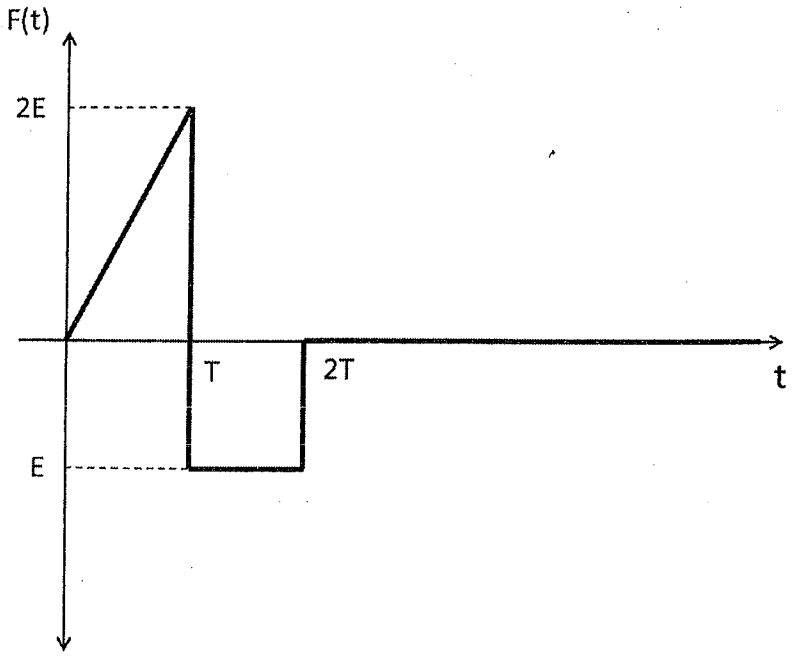

Figure 03