EASTERN UNIVERSITY, SRI LANKA

THIRD EXAMINATION IN SCIENCE 2005/2006 (AUG-SEP. 2007)

FIRST SEMESTER

PH 301 – ELECTRONICS II

Time: 01 hour.

Answer ALL Questions.

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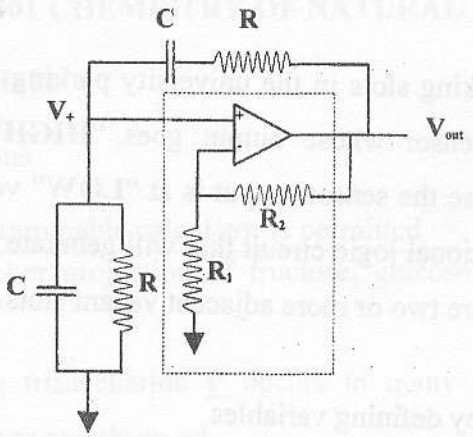
1. Explain what is meant by positive and negative feedback as applied to electronic circuits.

A Wien Bridge Oscillator Circuit is shown in the figure below. The Oscillator consists of a non-inverting amplifier and an RC feedback network.



(i) Show that the transfer function for the RC feedback network outside the broken rectangle is $\frac{v_+}{v_{out}} = \frac{1}{3 + j\left(\omega RC - \frac{1}{\omega RC}\right)}$

(ii) If R=10kΩ and C=10nF, at what frequency will the circuit oscillate?

Hence evaluate $\frac{v_+}{v_{out}}$ at this frequency.

(iii) Show that the gain of the ideal non-inverting amplifier inside the broken rectangle is given by $\frac{v_{out}}{v_+} = \frac{R_1 + R_2}{R_1}$

(iv) Hence calculate the value of R_2 needed to promote oscillation when R_1=10kΩ.

(v) The circuit would probably not start oscillation when switched on or, alternatively, may produce a clipped waveform. Why does this happen? How could you modify the circuit to prevent this from happening?

2. Draw the symbols and truth table for the following.

   (a) AND

   (b) OR

   (c) NAND

   (d) NOR

There are four adjacent parking slots in the university parking area. Each slot is equipped with a special sensor whose output goes "**HIGH**" when a car is occupying the slot. Otherwise the sensor output is at "**LOW**" voltage. You are to design and draw a combinational logic circuit that will generate a "**HIGH**" output voltage if and only if there are two or more adjacent vacant slots.

(a) Formulate the problem by defining variables

(b) Write the truth table for the problem

(c) Convert the truth table into logical expression

(d) Simplified the logical expression

(e) Draw the simplified logic circuit using basic logic gates.