

EASTERN UNIVERSITY, SRI LANKA

THIRD EXAMINATION IN SCIENCE - 2003/2004

(NOV/DEC 2004)

FIRST SEMESTER

PH 301 ELECTRONICS II

Time: 01 hour.

Answer ALL Questions

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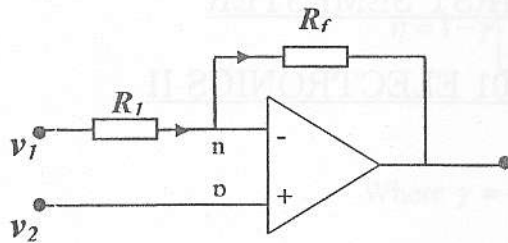
1.

(i) Describe the major properties of an ideal operational amplifier.

Draw circuits and derive the relation between the input and output signals of the following operational amplifier.

- (a) Inverting amplifier
- (b) Non-Inverting amplifier
- (c) Adder

(ii)



In the above circuit if  $R_1 = 1 \text{ K}\Omega$ ,  $R_f = 10 \text{ K}\Omega$ ,  $v_1 = 4 \text{ V}$  and  $v_2 = 4.5 \text{ V}$  then determine the output voltage and CMRR of the differential amplifier.

(iii) Solve the following simultaneous equations for x and y using operational amplifier.

$$\begin{aligned} a_1x + b_1y &= c_1 \\ a_2x + b_2y &= c_2 \end{aligned}$$

2. Draw the symbols and truth table for the following

- (a) AND
- (b) NAND
- (c) OR
- (d) NOR

Simplify the following expressions.

- (i)  $Z = (\bar{A} + B) (A + B)$
- (ii)  $Z = (\bar{A} + B) (A + B + D) \bar{D}$
- (iii)  $Z = \bar{A}BCD + A\bar{B}\bar{C}\bar{D} + A\bar{B}C\bar{D} + A\bar{B}C\bar{D} + A\bar{B}C\bar{D} + A\bar{B}C\bar{D} + A\bar{B}C\bar{D} + A\bar{B}C\bar{D} + ABCD$
- (iv)  $Z = \bar{A}C(\bar{A}BD) + \bar{A}B\bar{C}\bar{D} + A\bar{B}C$
- (v)  $Z = (A + B) (\bar{A} + C) (\bar{B} + C)$

A lamp in a room is to be operated from two switches, one at the back door and one at the front door. The lamp is to be **ON** if the front switch is **ON** and the back switch is **OFF**, or if the front switch is **OFF** and the back switch is **ON**. The lamp is to be **OFF** if both switches are **OFF** or if both switches are **ON**. Let a **HIGH (1)** output represent the **ON** condition and a **LOW (0)** output represent the **OFF** condition. Construct a logic circuit for this system.