

**UNIVERSITY OF ESWATINI**  
**FACULTY OF SCIENCE & ENGINEERING**  
**DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING**

SUPPLIMENTARY / RESIT EXAMINATION JULY 2019

TITLE OF PAPER: **BASIC ELECTRONICS**

COURSE CODE: **EEE222**

TIME ALLOWED: **THREE HOURS**

**INSTRUCTIONS:**

1. Answer all five (5) questions
2. Each question carries 20 marks.
3. Marks for different sections are shown in the right-hand margin.

This paper has 3 pages including this page.

**DO NOT OPEN THE PAPER UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATOR.**

**QUESTION 1**

- A) For the circuits shown in Figure 1 A and Figure 1B using ideal diodes, find the values of the labelled voltages and currents. (15 marks)
- B) For the circuits shown in Figure 1 A using a diode with  $V_D = 0.7 \text{ V}$ , find the value of current  $I_1$ . (5 marks)

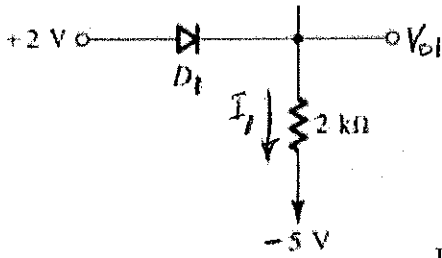


Figure 1A

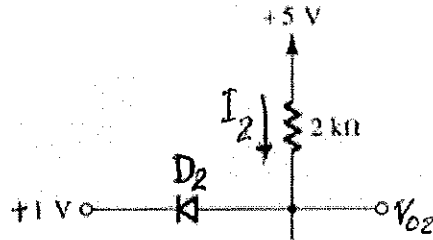


Figure 1B

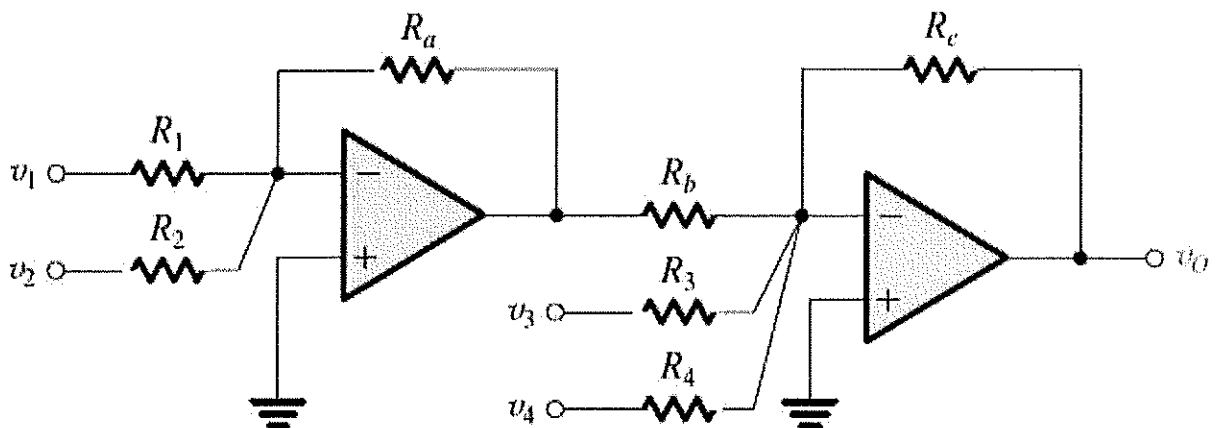
**QUESTION 2**

- a) Sketch the current - voltage characteristics of a silicon diode and show all relevant details. (10 marks)
- b) Sketch the current - voltage characteristics of a zener diode and show all relevant details. (10 marks)

**QUESTION 3**

For the circuit shown in Figure 3, derive the expression for the voltage  $V_o$  and then find the voltage  $V_o$  when  $R_1 = R_b = R_4 = 2 \text{ k}\Omega$ ,  $R_2 = R_a = R_3 = 4 \text{ k}\Omega$ , and  $R_c = 5 \text{ k}\Omega$  in terms of the inputs.

(20 marks)



**QUESTION 4**

If a MOSFET transistor has  $g_m = 2 \times 10^{-3}$  and  $r_o = 100 \text{ k}\Omega$ ,

- (a) Draw a complete small-signal equivalent circuit for the amplifier. (10 marks)
- (b) Find  $R_{in}$ ,  $v_{gs}/v_{sig}$ ,  $v_o/v_{gs}$ , and  $v_o/v_{sig}$ . (10 marks)

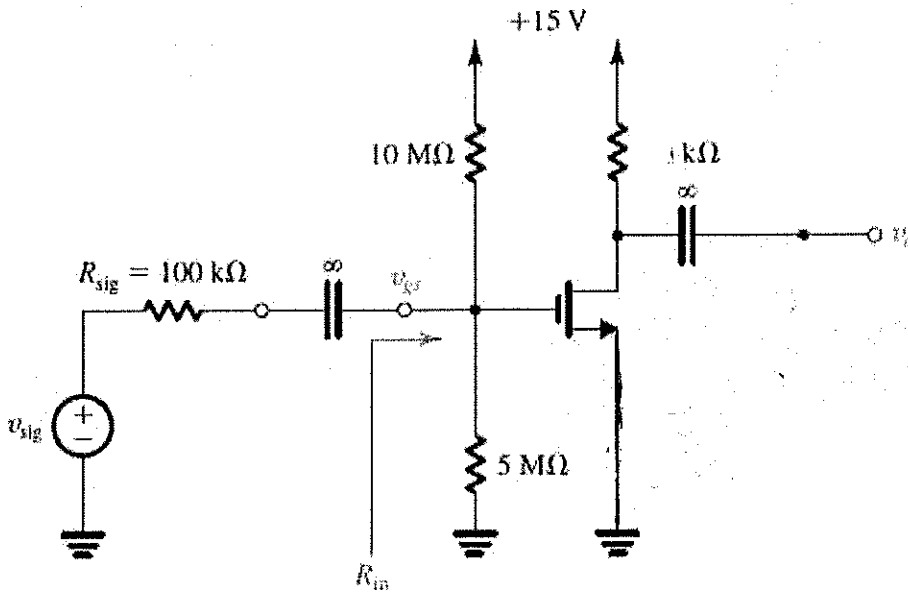


Figure 4

**QUESTION 5**

For the logic circuit shown in Figure 5, obtain the function F and then the truth table for the function F. (20 marks)

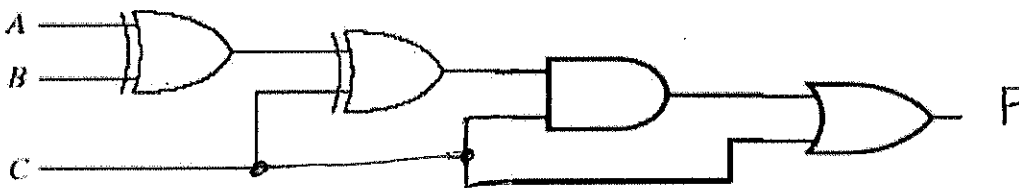


Figure 5