Circuit Theory and Electronics Fundamentals

EXAM PART II = TEST 2

July/08/2021. Duration: 1h30m

Only blank scratch paper and calculator are allowed on your desktop. Checking books or notes is not allowed. Solve each problem group in a separate sheet group to facilitate and speed up grading. Write your name and student number on all sheets delivered. ***Unidentified sheets will be not be graded****. The figures are in the next page.*

1. Consider the limiter circuit in Figure 1, where $V_{ON}=0.5$V for diode D1, and $V_{ON}=1$V for the LED.

a) Compute V_O for $I_S=1mA$ and $I_S=-1mA$.

b) Derive the $v_O(i_S)$ characteristic and sketch its graph for i_S in the interval [-1, 1] mA.

c) For $i_S(t) = 2\ sin(\omega t)\ mA$, sketch the graphs of $i_S(t)$, $v_O(t)$ and $i_2(t)$ during one period.

d) Under the same conditions of c), compute the maximum instantaneous power dissipated by the diode D1 and by the LED.

2. Consider the BJT amplifier circuit in Figure 2.

a) Find the value of R_{B2} for which $V_E=6$V at the operating point.

If you have not answered a), for the following questions assume $R_{B2}=40$kΩ.

b) Draw the incremental circuit for the pass-band and determine the voltage gain and the input and output impedances.

c) Determine the 3dB cut-off frequency for For $C_I=\infty$ and $C_O=1\mu$F; indicate the type of filtering realized by the amplifier.

3. Consider the OP-AMP circuit in Figure 3.

a) Compute V_O for $V_A=2$V and $V_B=5$V with the 3-way switch in position 1.

b) Compute V_O for $V_A=3$V and $V_B=-1$V with the switch in position 2.

c) Compute $v_O(t)$ with the switch in position 2, $V_A=-1$V and $v_B=2cos(\omega t)$ V.

d) Compute $v_O(t)$ with the switch in position 3, $V_A=-1$V, $v_B= cos(\omega t)$ V and $f=1$kHz.

TRADUÇÃO

Prencha o seu primeiro (First Name) e último nome (Last Name), número de aluno (Number) e sala (Room) no cabeçalho. Apenas a calculadora e folhas brancas de rascunho são permitidos. O teste é sem consulta. Resolva cada grupo de problemas num grupo de folhas separado para facilitar e acelerar a correção. As figuras estão na página seguinte.

Answers' grading / Cotação das perguntas

1-a)	1-b	1-c)	2-a)	2-b)	2-c)	3-a)	3-b)	3-c)	3-d)
2	2	2	2	2	2	2	2	2	2

Figures / Figuras

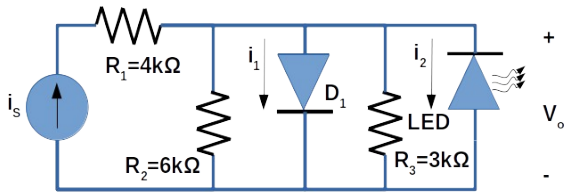

Figure 1

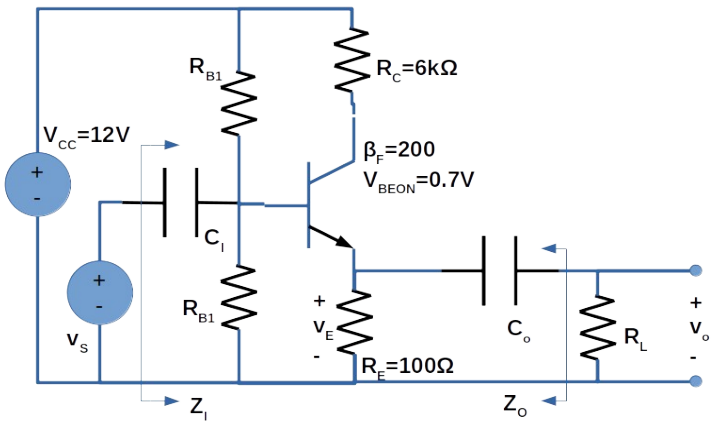

Figure 2

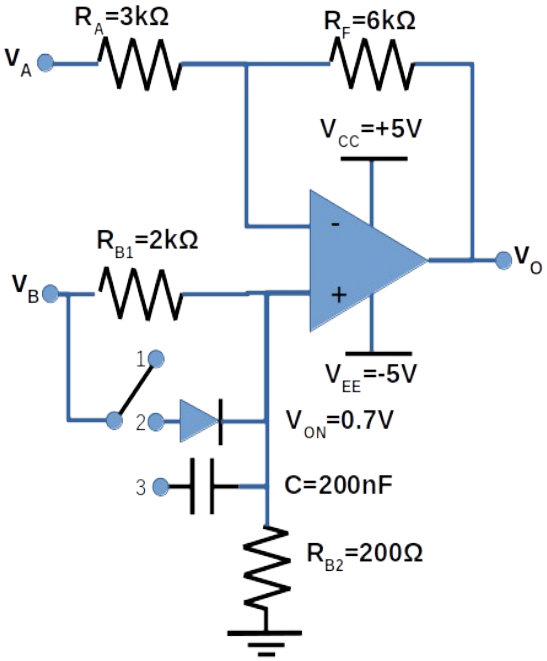

Figure 3