INTERNATINONAL UNIVERSITY (IU) – VIETNAM NATIONAL UNIVERSITY – HCMC

Mid-term Examination Replacement
Begin: April 20th , 2020
Submit: April 27th, 2020
Question Code: 15

SUBJECT: Electronic Devices	
Dean of School of Electrical Engineering Signature: Full name: Mai Linh	Lecturer Signature: Full name: Tran Van Su

INTRODUCTIONS:

1. Exam questions are available on Blackboard
2. Answers must be typed and submitted on Blackboard in .PDF file.
3. Do not copy other materials because your answer files will be checked with Turnitin
4. Please write down your name, student ID and question code.

Question 1(10pts)

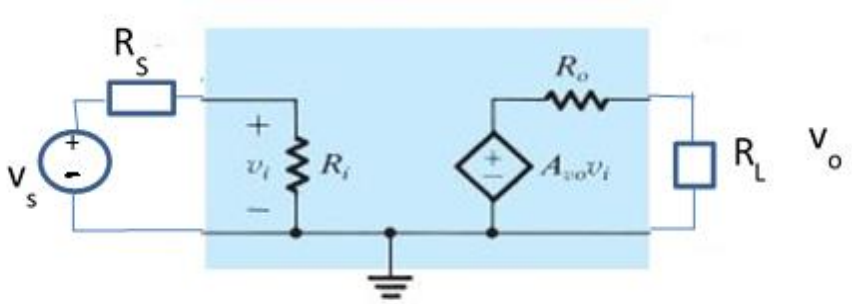


Figure shows an amplifier circuit with **Vs** = 0.15sin(ωt) V, **Rs** = 240 Ω, **Ri** = 520Ω, $\mathbf{A_{vo}}$ = 25, $\mathbf{R_o}$ = 150Ω and $\mathbf{R_L}$ = 750Ω.

a. Determine V_o.

b. What is the value of R_L to deliver maximum power to R_L.

Question 2(15pts)

a) Draw and design a difference amplifier using an ideal op-amp with input impedance of **Rin** =500 kΩ, input voltages $\mathbf{V_2}$ = 1.5V, $\mathbf{V_1}$ = 0.8V, and output voltage of V_o = 4.9V.

b) Draw and design an instrumentation amplifier using ideal op-amps with input impedance of Rin = ∞, input voltages V_2 = 0.5V, V_1 = -0.2V, and output voltage of V_o = 9.8V.

Question 3(15pts)

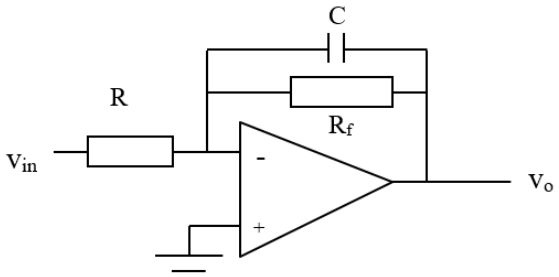


Fig. 3

An ideal op-amp is shown in Fig. 3 with R = 1 kΩ, $\mathbf{R_f}$ = 11.4 kΩ and **C** = 0.1μF

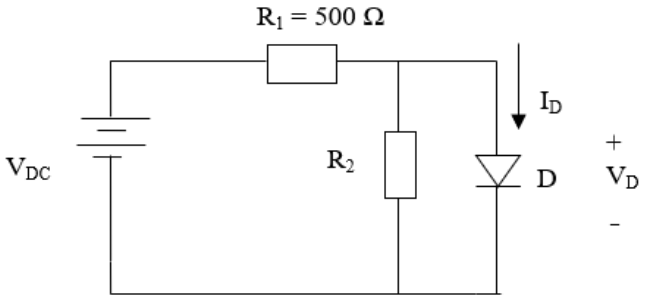
a. Give the expression of transfer function of the voltage gain V_o/V_{in}

b. Compute the 3-dB frequency in Hz.

c. Compute the unity-gain frequency in Hz.

d. Given that the slope of magnitude of the voltage gain V_o/V_{in} is -20dB/decade, estimate the magnitude of the voltage gain at **f** = 450 Hz.

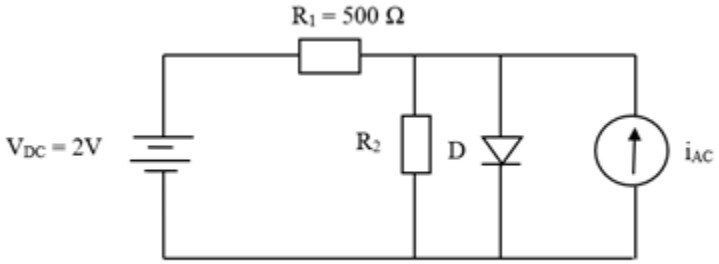
Question 4(15pts)



A silicon diode with ideality factor n = 1 has $\mathbf{I}_D$ = 6.1mA and Is = 10^{-14}A shown in the figure.

a. If $R_2 = \infty$, find V_D and V_{DC}.
b. If $\mathbf{R}_2$ = 650 Ω, find V_{DC}

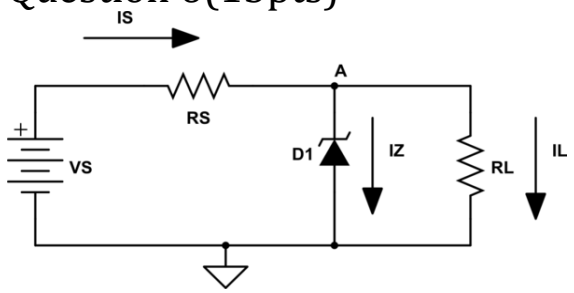
Question 5(15pts)



The constant-voltage-drop model is used for the diode (D) in Figure with V_{D0} = 0.65V. The ideality factor n = 1.
$\boldsymbol{R}_2 = 450\ \Omega\ ;\ \boldsymbol{i}_{AC} = 0.009\cos(\omega t)$ (A)

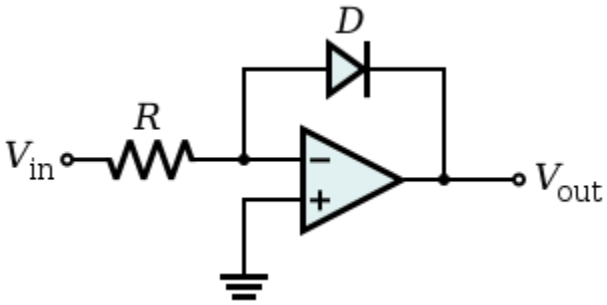
a. Find the current i_D.
b. Find the voltage v_D

Question 6(15pts)



Find maximum Rs if **V**s varies from 9V to 11V, $\mathbf{I}_L$ varies from 4mA to 5mA, $r_z = 5\Omega$, V_{zo} = 3.9V and I_{zmin} = 1mA. Find Maximum power dissipated in Zener diode

Question 7(15pts)



Figure

a. An ideal op-amp is connected with resistance R and diode D shown in Figure. The current of the diode is $i_D = I_S e^{\frac{v_D}{v_T}}$ (A). Find relationship between V_0 and V_{in}.

b. If $\mathbf{V}_{in}$ = 1.4V, **R** = 2.7 kΩ, $I_S = 10^{-14}$ A, find v_D