EE210: HW-3

Date: 22.01.2019

The diode in the problems given below has the following characteristics:

$I_S = 2 * 10^{-15}$A; n = 1; $V_T = 26mV$; $C_{j0} = 2.63pF$; $V_{bi} = 0.85V$; m = 0.5; $\tau = 26$ns

Q.1 Using iterative analysis, determine the current flowing in a circuit shown in Fig. 1.

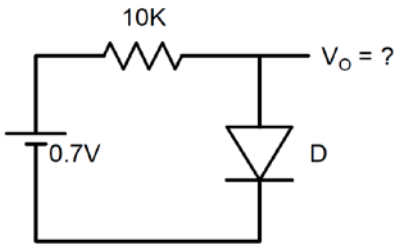

Fig. 1

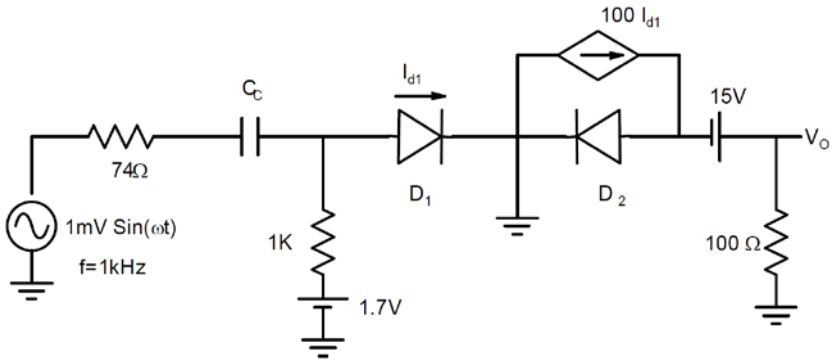

Fig. 2

Q.2 For the circuit shown in Fig. 2, first, carry out a dc analysis of the circuit assuming a simple diode model to determine the dc value of output voltage. Using small signal analysis and small signal diode model, next, determine the sinusoidal output voltage. Assume that capacitor C_C is large enough, so that it can be approximated as a short for small signal ac analysis. Since the frequency is low, the internal capacitance of the diodes can be ignored. Sketch the complete output voltage (dc + ac).

Q.3 The diode in the circuit shown in Fig. 3 is used as a variable capacitor. Determine a suitable value of resistor R and reverse bias voltage V_R so that output sinusoidal voltage has a magnitude of 100mV. (Use the concept of resonance.) Can we call this circuit an amplifier?

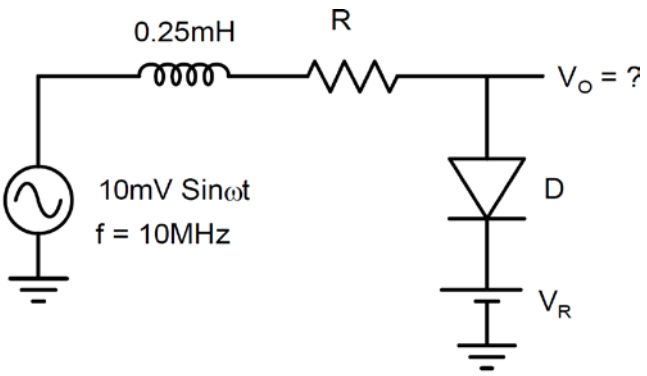

Fig. 3

Q.4 Determine an expression for the output voltage in the circuit shown below. Assume that diodes are identical and that differential amplifier does not draw any input current and has a differential voltage gain $A_V = \frac{V_0}{V_+ - V_-}$.

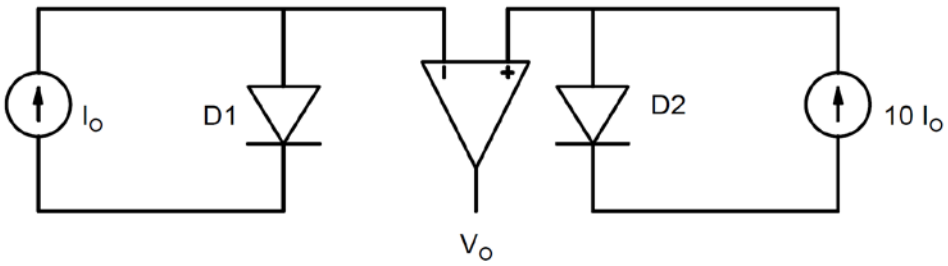

Fig. 4

Q.5 Figure 5a below shows a diode circuit, whose small signal sinusoidal response is shown in Fig. 5b. Determine the variables A, f_L and f_H. (Hint: For lower cutoff frequency f_L, only C_C matters, while for f_H, only diode capacitances matter).

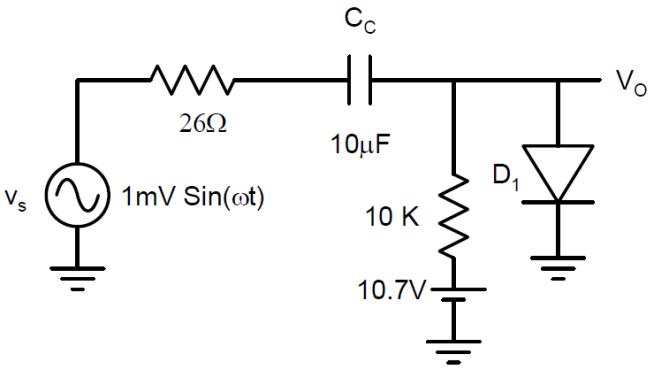

Fig. 5a

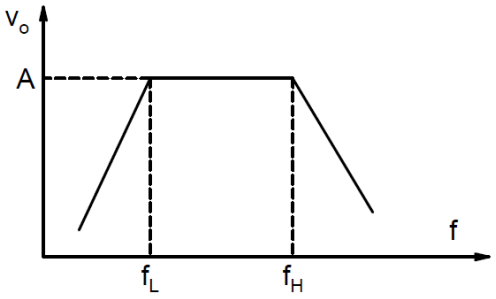

Fig.5b