ECE 322 Winter 2016

Test 1 (02/01/16)

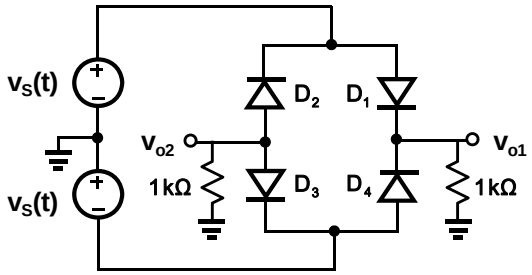
Total # Pages 4
Total # Problems 4

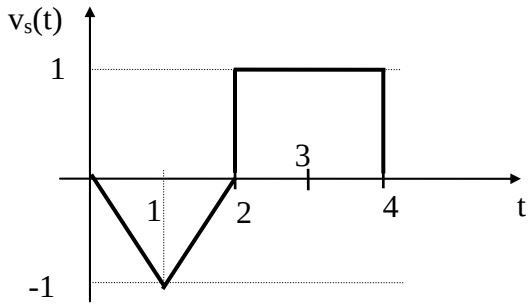
Name_____

1.	**(10 points)**	_____
2.	**(25 points)**	_____
3.	**(40 points)**	_____
4.	**(25 points)**	_____
Total	**(100 points)**	_____

GOOD LUCK

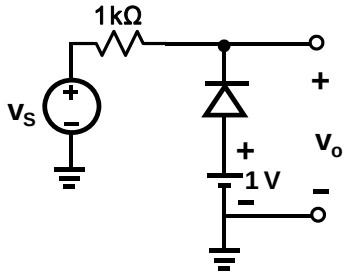
1. A diode circuit and voltage waveform $v_s(t)$ are shown. **(10 points)**.

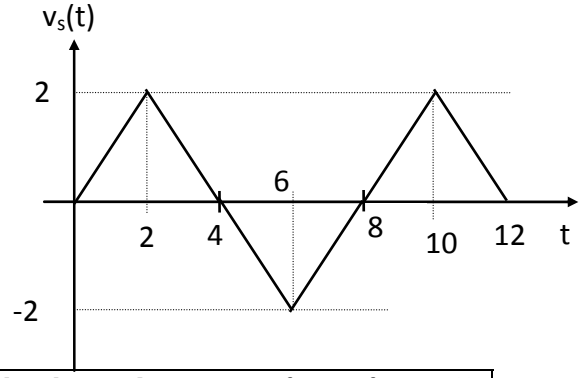




List which diodes are ON (i.e., forward biased and conducting current) and which are OFF for $0 < t < 2$. Assume **ideal** diodes.	List which diodes are ON and which are OFF for $2 < t < 4$. Assume **ideal** diodes.
ON Diodes: OFF Diodes:	ON Diodes: OFF Diodes:

2. Consider the diode circuit shown below with a signal voltage waveform $v_s(t)$ as shown. Draw the specified voltage waveforms in the table below. **(25 points)**.





Sketch the voltage waveform for $v_o(t)$ assuming an **ideal** diode. Label the time axes and the signal values.	Sketch the voltage waveform for $v_o(t)$ assuming a **constant voltage drop model** for the diode (**the diode voltage is at 0.5V when conducting**). Label the time axes and the signal values.
	

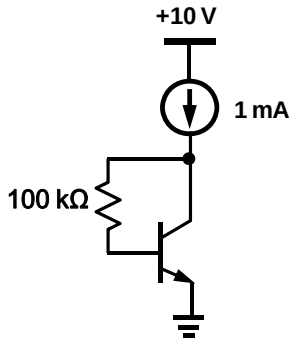
3. Answer the following questions. **$|V_{BE}|$ = 0.7V for an ON transistor and $|V_{CE}|$ = 0.2V when the transistor is in saturation**.

a) For the bipolar transistors and conditions shown in the following table calculate the missing entries. **(15 points)**.

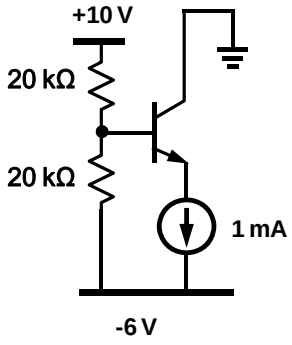
Device	I_C (mA)	I_B (mA)	I_E (mA)	α	β
a	2				50
b			1	0.98	
c		10	110		10

b) In the circuit shown, calculate the collector current and collector voltage assuming β = 100. **(10 points)**.

I_C = _____ V_C = _____



c) For the circuit shown determine the region of operation (cutoff, active, or saturation) for the transistor with β = 49. **(15 points)**.



4. For the circuit shown, the emitter voltage is 4 V. Calculate the collector voltage and collector, base, and emitter currents for the transistor. Use this information to calculate α and β. **Do not assume large β. $|V_{BE}| = 0.7V$ for an ON transistor. (25 points)**.

I_C = _____ I_B = _____

I_E = _____ V_C = _____

α = _____ β = _____