Department of Electronic & Telecommunication Engineering
University of Moratuwa
B.Sc. Eng., Semester 2
EN1014 : Electronic Engineering
Tutorial on Semiconductors and Diodes

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1. When silicon is doped with antimony, what is the resulting semiconductor? What are its majority carriers and minority carriers?

2. A silicon diode has a reverse saturation current, I_s, of 2nA at 25°C. What is the value of I_s at 75°C? Assume that I_s doubles every 10°C rise in temperature.

3. What is the power dissipation in a forward biased silicon diode if the voltage is 0.7V and the current is 100mA?

4. A diode reaches its maximum power rating of 2W when operating in the forward mode at a forward voltage of 900mV. Calculate, (a) the maximum allowable forward current, $I_{f(max)}$, (b) the forward bias resistance, R_f.

5. In Fig.Q5(a), V_s = 5V. (a) Determine I_f for R_L = 100Ω. (b) Find a value for R_L that will give I_f = 30mA. Diode characteristics are given in Fig.Q5(b).
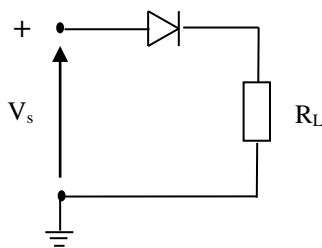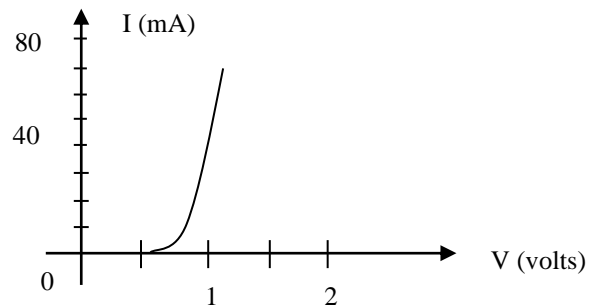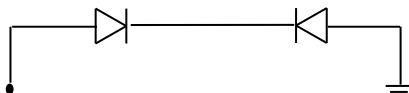

Fig:Q5(a)

Fig:Q5(b)

6. Two silicon diodes are connected in series as shown i.. .ig..... . 5V voltage is impressed upon them. Find the voltage across each diode at room temperature assuming V_T = 26mV.

Fig:Q6

7. A diode connected a +5V ʼn in Fig.Q7(a) has the characteristics shown in Fig.Q7(b). R_L = 500Ω and the input voltage has a peak of 50V. Calculate the positive and negative peaks of output voltage developed across R_L. Also determine the peak load current and the diode power dissipation.
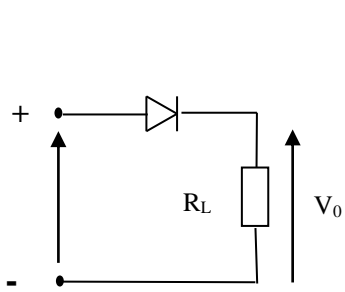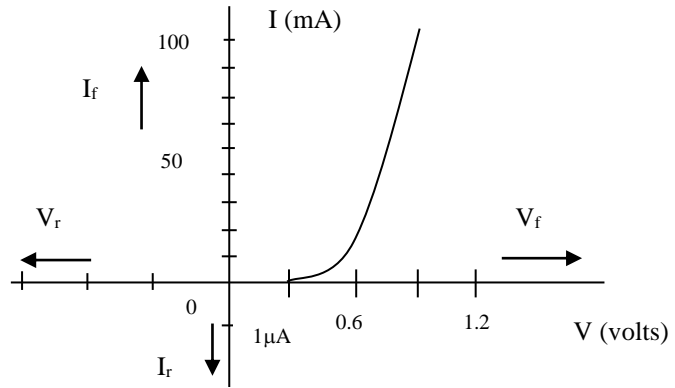
Fig:Q7(a)

Fig:Q7(b)

8. The breakdown voltages and their current ratings of some diodes are shown in the table below;

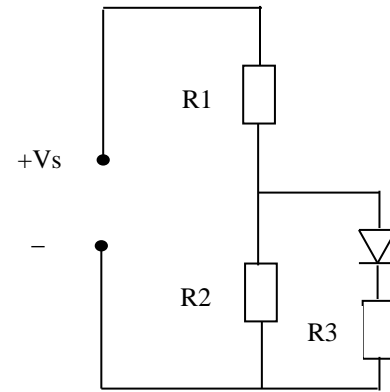| Diode	PIV rating	$I_{f(max)}$
1N914	75 V	200 mA
1N4001	50 V	1 A
1N1185	120 V	35 A

Fig:Q8

In the circuit shown in Fig.Q8, if V_s = 200V, $R_1 = R_2 = R_3$ = 10K and the polarity of the source is reversed, which of the above diodes will break down when used in the circuit?

9. Specifications of three diodes are given in the table below;

Diode	I_f	I_r
1N914	10mA @ 1V	25nA @ 20V
1N4001	1A @ 1.1V	10μA @ 50V
1N1185	10A @ 0.95V	4.6 mA @ 100V

Calculate the reverse / forward resistance ratios for each of the above diodes.

10. For the circuits in figure Q10 employing ideal diodes, find the labelled currents, I_x, and voltages, V_x, measured with respect to ground.

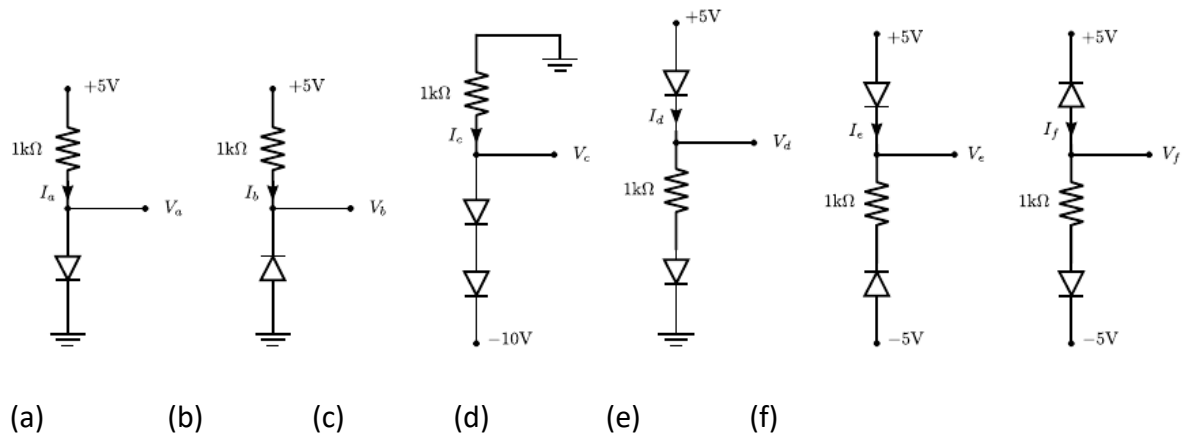
(a)   (b)   (c)   (d)   (e)   (f)

Fig.Q10

11. A burglar alarm unit needs 12 Volt DC for its normal operation. It draws 50 mA from the 12V supply. It should operate using a 12 V non-rechargeable backup battery during power failures.

Show in a schematic block diagram how you would connect the system with DC supply and the 12 V backup battery.

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