

Sample Questions of Mid-Term Quiz (Time Allowed : 1 hour)

Name		Total
Matric. No.		

1. Answer all questions.
2. The questions DO NOT carry equal marks.
3. Take $T = 300 \text{ K}$, $V_T = kT/q = 0.025 \text{ mV}$, $q = 1.602 \times 10^{-19} \text{ C}$, $n_i = 1.5 \times 10^{10} \text{ cm}^{-3}$, $\epsilon_0 = 8.854 \times 10^{-14} \text{ F cm}^{-1}$, $\epsilon_r (\text{silicon}) = 11.7$.
4. A list of formulas are provided in a separate Appendix for your reference.

	Marks given
<p>Q A piece of semiconductor is doped with an impurity that makes it p-type. Assume that all the dopants are ionised and that the semiconductor is at thermal equilibrium.</p> <p>For each of the statements below, circle TRUE if the statement is correct, and FALSE if the statement is wrong.</p> <p>(Marks will be deducted for each wrong answer you give. No mark will be deducted if you do not answer.)</p> <p>(a) The positive charges are protons and the negative charges are ionised acceptors. (1 mark) TRUE / FALSE</p> <p>(b) The positive charges are ionised donors and the negative charges are conduction electrons. (1 mark) TRUE / FALSE</p> <p>(c) The positive charges are holes and the negative charges are ionised acceptors. (1 mark) TRUE / FALSE</p> <p>(d) The positive charges are holes and the negative charges are ionised donors. (1 mark) TRUE / FALSE</p>	

Q An ideal diode (with $n = 1$) has the I-V characteristic shown in Figure A below. The same diode is used in the circuit shown in Figure B, where $v_{dd} = 5 \text{ mV}$ and $I_D = 1.5 \text{ mA}$.

(6 marks)

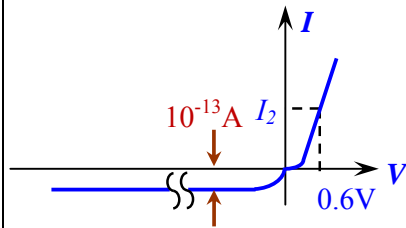


Fig. A

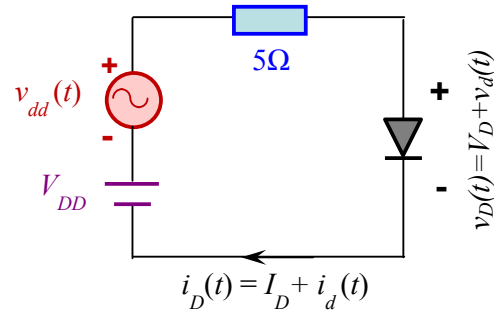


Fig. B

- (a) What is the value of the reverse saturation current of the diode?

Ans _____ A

- (b) What is the value of I_2 in Fig. A?

Ans _____ A

- (c) What is the value of the small signal resistance of the diode in Fig. B?

Ans _____ Ω

- (d) What is the value of $i_d(t)$ in Fig. B?

Ans _____ A