

國立臺北大學 106 學年度碩士班一般入學考試試題

系（所）組別：電機工程學系甲組(晶片設計組)

科目：電子學 A

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☐可 ☒不可使用計算機

1. (10%) Explain (a) drift current, (b) velocity saturation of electrons.
2. (10%) (a) Draw I_C versus V_{CE} curve of an npn BJT considering early effect, (b) explain early effect.
3. (10%) (a) Draw I_D versus V_{DS} curve of an n-type MOSFET considering channel length modulation, (b) explain channel length modulation.
4. (10%) Explain (a) zener breakdown, (b) avalanche breakdown of a diode.
5. (10%) Explain the operational principle of an n-type MOSFET from the effect that is induced by electrical field.
(a) How does V_{GS} control I_{DS} ? (b) How does V_{DS} control I_{DS} ?
6. (10%) For an npn BJT, the collector current $I_C = I_S \exp(V_{BE}/V_T)(1 + V_{CE}/V_A)$. Define the small-signal resistance between collector and emitter, then prove that it equals to V_A/I_C .
7. (10%) The drain current of MOSFET is $I_D = (1/2)(\mu_n C_{ox})(W/L)(V_{GS} - V_{TH})^2$. Define transconductance g_m , then prove that it is proportional to square root of I_D .
8. (10%) Define the condition that operates in the region, (a) active region of BJT, (b) saturation region of MOSFET.
9. (10%) Explain whether they are hole current, electron current, or combination of both. (a) emitter current of npn BJT, (b) source current of p-type MOSFET (PMOS).
10. (10%) The BJT amplifier design has three topologies, common emitter, common base and common collector. (a) Why is the output not able to be connected to the base? (b) Why is the input not able to be connected to the collector? (*Draw the device symbol and explain.*)

試題隨卷繳交