國立成功大學
111學年度碩士班招生考試試題

編　號：156

系　所：生物醫學工程學系

科　目：電子學

日　期：0219

節　次：第 2 節

備　註：可使用計算機

編號： 156

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※ 考生請注意：本試題可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

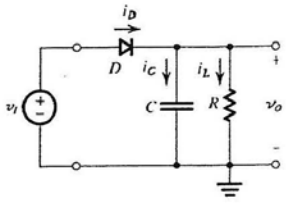
1. **(Total 20%)** Please explain in what kind of conditions that the MOSFET enters saturation region / triode region (10%) and what are the drain current (I_D) of NMOS in saturation / triode region (10%)?

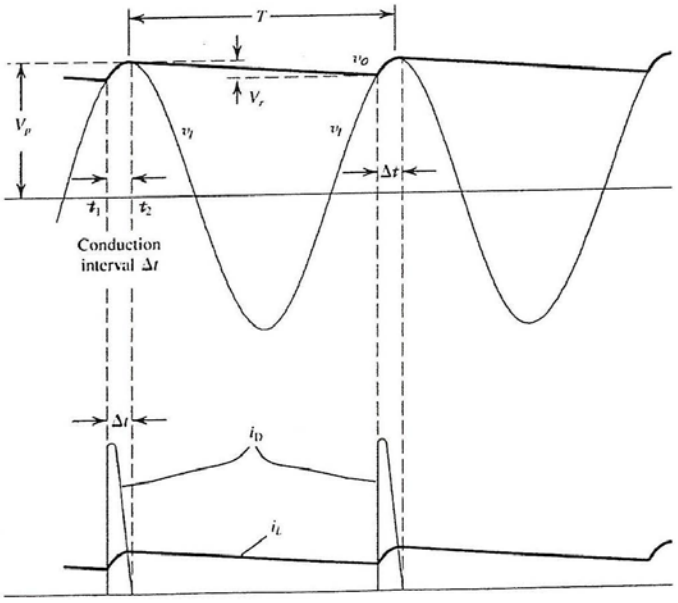
2. **(Total 20%)** (A) Please derive the Boolean function between output (Y) and input (A and B) as shown in the truth table of Table 1 (5%). Please draw the circuit using (B) Diode (5%), (C) BJT (5%), (D) MOSFET (5%) that can fulfill the Boolean function as you derive in (A).

Table 1

***A* (Input-1)**	***B* (Input-2)**	***Y* (Output)**
0	0	0
0	1	1
1	1	0
1	0	1

3. **(Total 10%)** For the half-wave rectifier shown in the following figure (left), its corresponding input/output waveform is shown in the right side of the following figure. Let's assume the diode in the rectifier circuits is ideal, please find the equation of V_r (2%), $\omega\Delta t$ (2%), $i_{D\text{av}}$ (3%), $i_{D\text{max}}$ (3%).





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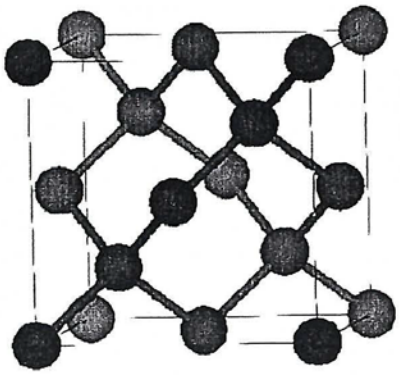
4. **(Total 20%)** (A) Please draw the circuit of BJT differential amplifier with BJT current-mirror loads (5%) and drive (B) differential gain (5%), (C) input differential resistance (5%), and (D) systematic input offset voltage (5%).
5. **(Total 20%)** Please draw the circuit of common-base amplifier (5%) and find its output resistance (15%).
6. **(Total 10%)** The lattice structure of Germanium is the same as silicon (diamond sturcture), the atomic weight Germanium is 72.59, and the lattice constant is 0.564 nm. Find the density (g/cm^3) (4%), atomic density ($atoms/cm^3$) (3%), and the spacing between nearest-neighbor atoms in Germanium (3%).



Lattice structure of Germanium