國立彰化師範大學九十六學年度碩士班招生考試試題

系所：電子工程學系　　科目：電子學

★★請在答案紙上作答★★　　

1. Describe the difference of optical and electric properties between element (Si or Ge) and compound semiconductors (GaAs or GaN). (15%)

2. (a) Design a full-wave rectifier for an AC voltage source with V_{rms}=110 V to provide a 15 volt DC voltage. (7%)
   (b) Design a precision rectifier for instrumentation applications to rectify a signal with small amplitude of 0.1 V. (8%)

3. For an enhancement-type n-channel MOSFET,
   (a) derivate its i_D-V_{DS} relationship in the triode region, (10%)
   (b) sketch its characteristic curves and define the three distinct regions of operation. (10%)

4. In Fig. 1 transistor Q_1, biasing arrangement is not shown, is operating as a CE amplifier with an active load provided by Q_2. Transistors Q_2 and Q_3 form a current mirror. Neglecting the base currents of Q_2 and Q_3 and assuming their V_{BE}=0.7 V and that Q_2 has five times the area of Q_3,
   (a) find the value of I, (10%)
   (b) find R_{in} from V_i and $A_v=\frac{V_o}{V_i}$. (10%)

5. Starting from first principles and assuming ideal op amps, derive the transfer function (V_o/V_i) of the circuit in Fig. 2. (15%)

6. Realize a two-to-one multiplexer using pass-transistor logic. (15%)

Fig. 1

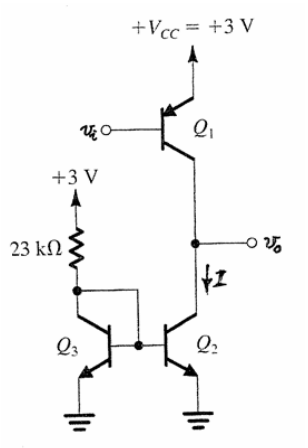

Fig. 2