

1. One set of the measured data for a MOS transistor is given below.
 - (a) Determine whether it is an enhancement or depletion device? NMOS or PMOS? (4%)
 - (b) Calculate the device transconductance parameter $k = \mu C_{ox}(W/L)$, zero-bias threshold voltage V_{T0} , and channel-length modulation parameter λ . (μ is the mobility, C_{ox} is the oxide capacitance, W is the channel width and L is the channel length) Don't miss their units! (9%)

V_{GS} (V)	V_{DS} (V)	I_D (μA)
2	5	10
5	5	400
5	8	480

2. (a) What is meant by BiCMOS technology? Explain the advantages that BiCMOS can offer. (6%)
- (b) What is the reason that many researchers use GaAs instead of Si as the material to fabricate very high speed IC? (3%)
- (c) What is the major property of a varactor diode? (3%)
3. For a TTL logic gate as shown in Fig. 1.
 - (a) What is the relationship between output Y and inputs A, B, C? (2%)
 - (b) Please evaluate the high level ($V(1)$) and low level ($V(0)$) of output voltage v_o . (4%)
 - (c) Please evaluate the average static power dissipation per gate. (6%)
4. Sketch the cross section of the FAMOS and briefly explain its operation. (8%)
5. (a) Draw dc and ac load lines for the amplifier shown in Fig. 2. (10%)
- (b) Find I_{CQ} and $S_{\beta} (= \frac{\Delta I_{CQ}}{\Delta \beta})$ for the amplifier shown in Fig. 3. (10%)
6. Find the oscillation frequency for the circuit shown in Fig. 4. (10%)
7. (a) Show how a switched-capacitor (SC) behaves as a resistor. (7%)
- (b) List at least 3 advantages of SC filter. (6%)
- (c) In the integrated circuits, the RC time constant of SC circuits are generally preciser than those of active RC circuits. Why? (12%)

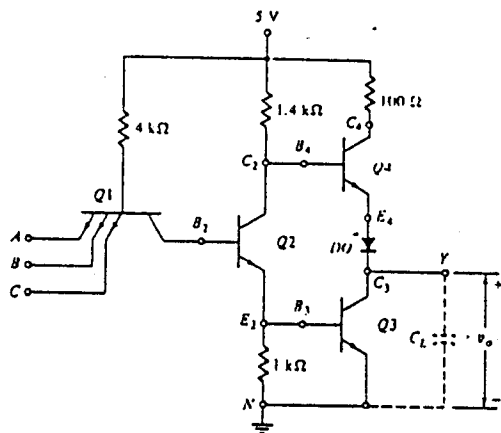


Fig. 1

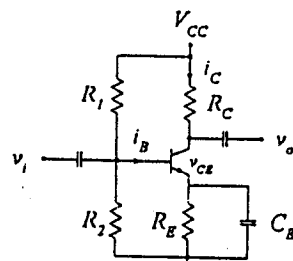


Fig. 2

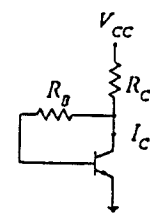


Fig. 3

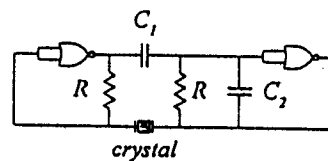


Fig. 4