

本試題是否可以使用計算機: 可使用, 不可使用 (請命題老師勾選)

- Fig. 1 shows a simple GaAs MESFET amplifier, with the W values of the transistors indicated. Assume that the dc component of v_I biases Q_1 at the current provided by the current source Q_2 so that both devices operate in saturation and that the dc output is at half of the supply voltage. Find (a) the β values for Q_1 and Q_2 , (b) V_{GS1} , (c) g_{m1} , r_{o1} , and r_{o2} , and (d) the small-signal voltage gain. The typical parameter value for λ is 0.1 V^{-1} . (20%)
- Draw the four basic feedback topologies. (10%)
- An alternative bridge amplifier configuration is shown in Fig. 2. Find the gain v_O/v_I , and the largest sine wave across R_L for op amps using $\pm 15 \text{ V}$ supplies that limit at $\pm 13 \text{ V}$. (20%)

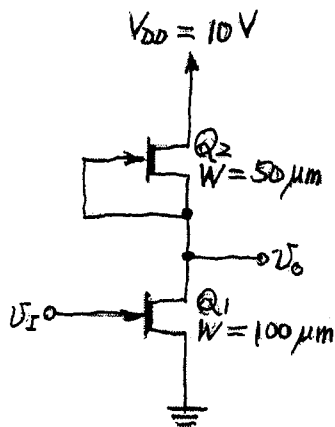


Fig. 1

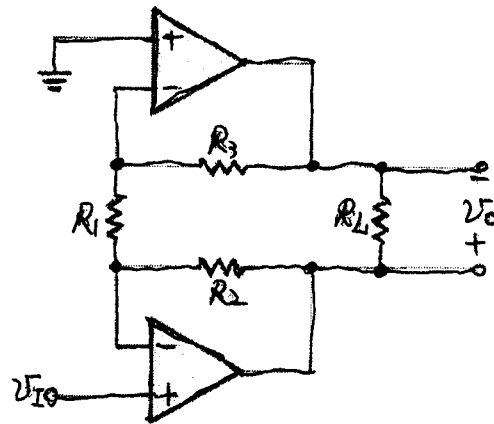


Fig. 2

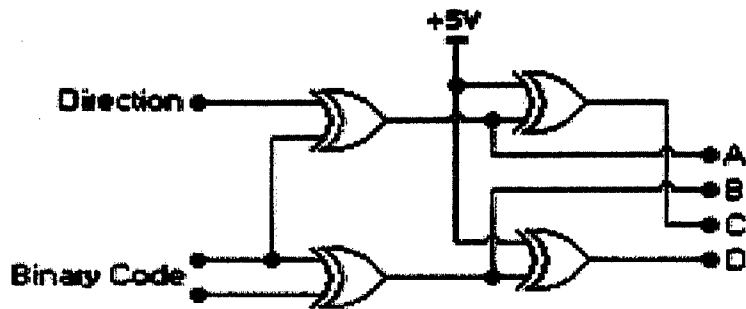
(背面仍有題目.請繼續作答)

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(4) (15 %) Figure 3 is the electronic circuit required to control a stepper motor that is used for stretching the joint angle of a human subject. Assume that the input is repetitive cycles of binary code 00, 01, 10, 11.

(a) Describe the output sequences of A, B, C, D when the Direction is open or grounded.

(b) Could you extend the device using any necessary electronic components to calculate the rotational velocity of the motor in terms of round per minute (RPM)?



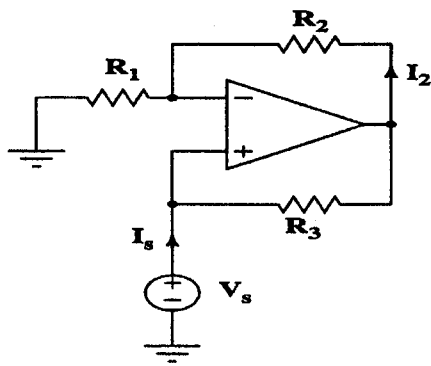
(Fig. 3)

(5) (20 %) Assume that the op-amps in Fig. 4 are all ideal operational amplifier.

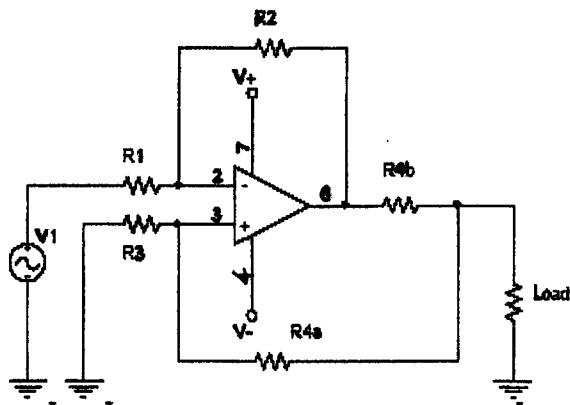
(a) Calculate the input resistance (V_s/I_s) in Fig. 4a. What is special of the result?

(b) The Fig. 4a can be extended to Fig. 4b as a modified Howland current source. Please calculate I_{Load} and explain why Fig.4b is a constant current source.

(c) Can you calculate the output resistance of Fig. 4b? Under what condition, the ideal output resistance will approach to infinity.



(Fig. 4a)



(Fig. 4b)

(6) (15 %) Explain the following terminologies generally used in electronics

- (a) Decoupling capacitor
- (b) Cross-over distortion in amplifier
- (c) Miller effect
- (d) Ground loop problem
- (e) Monostable multivibrator