國立彰化師範大學 101 學年度碩士班招生考試試題

系所：　車輛科技研究所　　　　　　　　　　　　　　　　　　科目：　電子學

☆☆請在答案卷上作答☆☆　　　　　　　　　　　　　　　　　　共 2 頁，第 1 頁

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1. Consider a 8-bit digital word $D=b_7b_6b_5b_4b_3b_2b_1b_0$ used to represent an analog signal v_a that varies between 0V and +15V. If v_a=+5V, what do you expect D to be? What is the resulting error (%) in representation? (20%)

2. For the circuit in Fig. 2 determine the voltage gain V_o/V_i and current gain i_L/i_i. (20%)
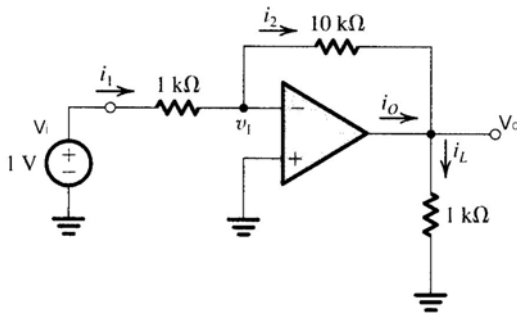

Fig. 2

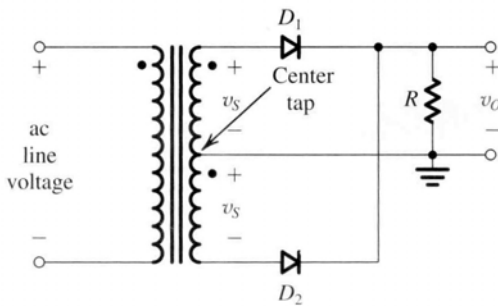3. For the wave rectifier circuit in Fig. 3a and 3b, draw the input and output waveform. (10%)
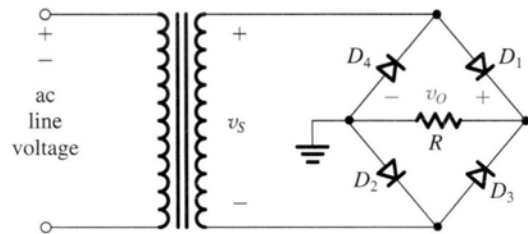

Fig. 3a　　　　　　　　　　　　　　　　　　Fig. 3b

4. An enhancement-type NMOS transistor with V_t=0.7v has its source terminal grounded and a 1.5V dc applied to the gate. In what region does the device operate for (a) V_D=+0.5V? (b) V_D=+0.9V? (10%)

5. The transistor in Fig. 5 is specified to have β in the range of 50 to 150. Find the value of R_B that results in saturation with an overdrive factor of at least 20. (20%)
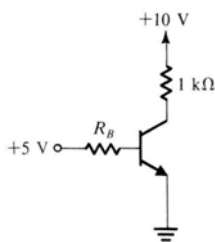

Fig. 5

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6. Explain the basic CMOS logic inverter (in Fig. 6a) behaves as an ideal inverter. (5%)
   If the signal source v_i is shown in Fig. 6b, draw the output waveform of v_o. (5%)
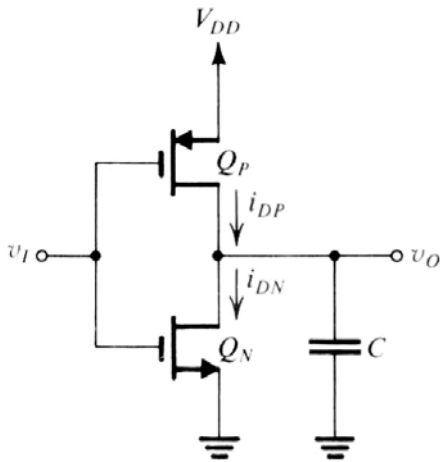

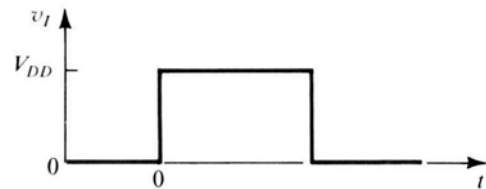Fig. 6a   Fig. 6b

7. Explain the following properties of negative feedback: (a) Gain desensitivity (b) bandwidth extension (c) noise reduction (d) reduction in nonlinear distortion. (10%)