國立雲林科技大學
97 學年度碩士班入學招生考試試題

系所：電子系
科目：電子學

1. Assuming the op amp to be ideal, derive an expression for the closed-loop gain v_{out}/v_{in} of the circuit shown in Fig. P1. (15%)

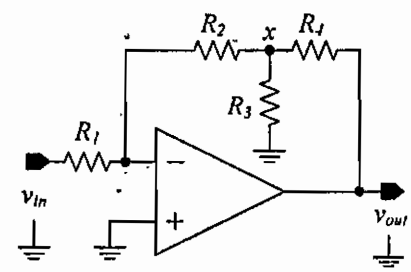

Fig. P1

2. For the circuit in Fig. P2, resistors R_1 to R_5 are set to be 2 KΩ.
   a. find the equivalent resistance to ground, R_{eq}, (5%)
   b. find the equivalent resistance R_{eq}, when R_4 reduced to 1.8 KΩ. (10%)

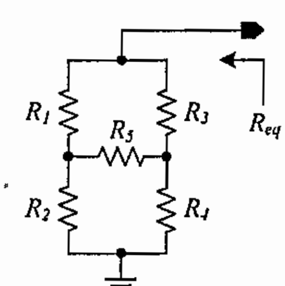

Fig. P2

3. Consider a peak rectifier fed by a 120 Hz sinusoid having a peak value V_p = 3.3 V. Let the load resistance R = 100 KΩ. Find the value of the capacitance C that will result in a peak-to-peak ripple of 0.1 V. (20%)

4. Write down the small-signal voltage gain, Fig. P4. (10%)

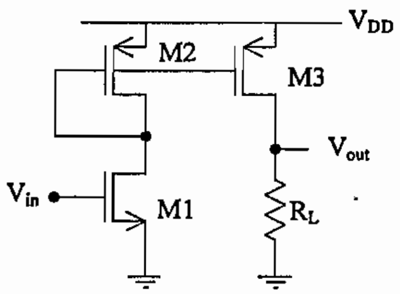

Fig. P4

5. An amplifier is shown in Fig. P5. Neglect the channel-length modulation and body effect of the transistors. The output impedance of M2 is much less than R_F. Find
   (a) low-frequency closed-loop gain. (10%)
   (b) closed-loop input impedance at low frequency. (10%)

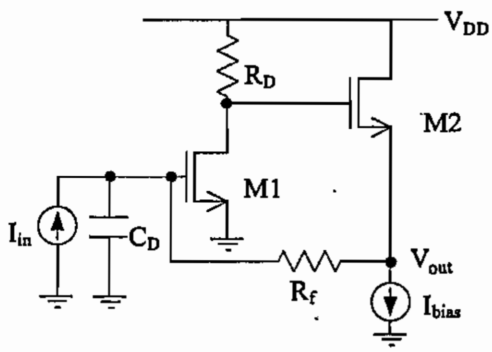

Fig. P5

6. For the circuit shown in Fig. P6, $\mu_n C_{ox} = 50\mu A/V^2$, $\lambda = 0V^{-1}$, $(\frac{W}{L})_{M1} = 40$,

   $I_{bias} = 200\mu A$, $\gamma = 0.4V^{1/2}$, $|2\phi_F| = 0.7V$, $V_{DD} = 5V$, and $V_{t_0} = 0.6V$. λ is the channel-length modulation coefficient. γ is the body effect coefficient.
   (a) Calculate V_{out} for $V_{in} = 1.2V$. (10%)
   (b) If I_{bias} is to be implemented by an NMOS transistor, find its minimum value $(\frac{W}{L})$ such that the NMOS transistor remains in saturation. (10%)

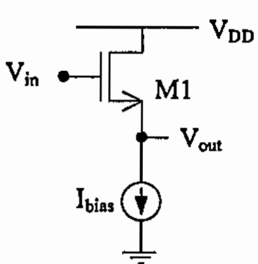

Fig. P6

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系所：電子系
科目：工程數學

1. Find the solution of the following equation:

(a) $x^2y'' - 2xy' + 2y = x^4e^x$ (10%)

(b) $y'' - 4y' + 4y = (x+1)e^{2x}$ (10%)

(c) $y'' + 2ty' - 4y = 1 \quad ; y(0) = y'(0) = 0$ (10%)

2. A large tank is fulled with 500 gallons of pure water. Brine containing 2 pounds of salt per gallon is pumped into the tank at a rate of 5 gal/min. The well-mixed solution is pumped out at the same rate Find the number A(t) of pounds of salt in the tank at time t.. What is concentration of the solution in the tank at t=5 min ?(10%)

3. Evaluate the surface integral $\iint_S G(x,y,z)ds$, where $G(x,y,z) = x$,

S: the portion of the cylinder $z = 2 - x^2$ in the first octant bounded by x=0, y=0, y=4, z=0. (10%)

4.(13%) Find the inverse of

$$A = \begin{bmatrix} 1 & 3 & 0 & 1 \\ 2 & 1 & 1 & 5 \\ 0 & 0 & 2 & 3 \\ 4 & 2 & 1 & 0 \end{bmatrix}.$$

5.(12%) Determine both the row rank and the column rank of

$$B = \begin{bmatrix} 1 & 2 & 3 & 4 & 1 \\ 2 & 0 & 1 & 6 & 0 \\ 3 & 4 & 5 & 1 & 2 \end{bmatrix}.$$

6.(13%) Find the Fourier transform of $5u(t)$, where $u(t)$ is the unit step function. Show your derivation clearly.

7.(12%) Suppose x(t) is a periodic function with a period π, and within [0, π] it is defined as

$$x(t) = 3e^{-t/2}, \quad 0 \le t \le \pi.$$

Determine the Fourier series of x(t).

國立雲林科技大學 97學年度碩士班入學招生考試試題	系所：電子系 科目：計算機概論

1. (A) Please write the Boolean function of *Way1* and *Way3* in Truth Table I. (5%)
   (B) Please draw the logic circuit of *Way1* and *Way3* with only NAND gate. (15%)

Input				Output		
A	***B***	***C***	***D***	***Way1***	***Way2***	***Way3***
0	0	1	1	0	0	0
0	1	0	1	1	1	0
0	1	1	0	1	0	1
1	0	0	1	0	1	0
1	0	1	0	0	0	1
1	1	0	0	1	0	0

Truth Table I

2. (A) Please convert the decimal number $(\mathbf{0.6875})_{10}$ to binary $(\mathbf{???})_2$ (5%)
   (B) Please convert the binary number $(11001010)_2$ to decimal, assuming that the number is an 8-bit 2's complement number. (5%)

3. Match each of the following algorithms with its worst-case time efficiency. (10%)

Algorithms	Time efficiency
Searching (sequential)	O(n)
Searching (binary)	$O(n^2)$
Sorting (selection sort)	O(1)
Data cleanup: converging pointers	O(m×n)
Data cleanup: shuffle left	$O(\log_2 n)$

4. Please define the following items and its function. (10%)
   (i) Cache
   (ii) RAM
   (iii) ALU
   (iv) RISC Processor
   (v) VGA

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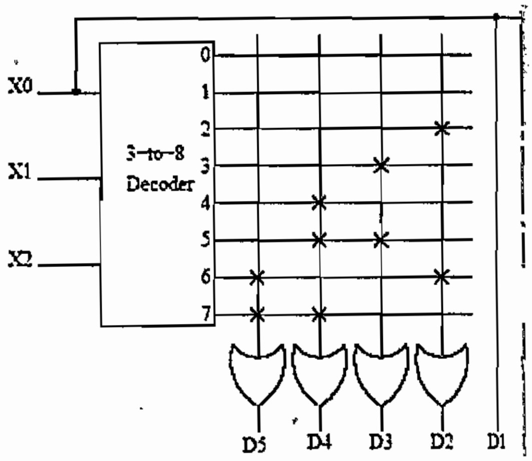
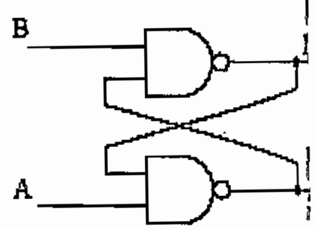
5. Given a canonical (standard) Sum-Of-Products (SOP) form with don't-care as follo
$F(A,B,C,D) = \Sigma m(0, 2, 4, 5, 8, 12, 13, 15) + d(6, 7, 10)$, please answer the followi
questions.
   (a) (4%) Construct the corresponding Karnaugh map based on F.
   (b) (10%) Minimize F using your K-map, and write down the new Boolean equation F_{min}
   SOP form.

6. A polynomial function F(X) was implemented in a Look-Up Table using an optimized $2^3 \times 6$ Read-Only Memory (ROM) as shown below. For a given input decimal value $x \in [0, 7]$, F(X) produces an output value represented by a 6-bit number: D5, D4, …, D0.
   (a) (10%) Please reverse-engineer the truth table (3 input bits / 6 output bits) of F(X).
   (b) (10%) What polynomial function F(X) performs?



7. Multiple choice problems
   (a) (4%) Given the following Latch, which of the following will cause an unstable state?



   a. A=B=0 b. A=1, B=0 c. A=0, B=1 d. A=B=1

   (b) (4%) How many information can be stored in one D Flip-Flop?

   a. One bit. b. Two bits. c. One byte. d. One word.

   (c) (4%) Which of the following storage components consumes less silicon area (i.e. fewer number of transistors)?

   a. One DRAM cell b. One SRAM cell c. one D Flip-Flop d. One 4-bit register

   (d) (4%) For a 18Kx8 memory module, which of the following is true?
   a. The total capacity is 128 kilo-bytes.
   b. There are 17 bit address lines in this memory module.
   c. It can address 16,384 locations.
   d. It is larger than a 4Kx32 memory module.