國立雲林科技大學 系所：電機系

九十一學年度研究所碩士班入學考試試題 科目：電路學

1. A random signal $s(t)$ with an rms value of 10V has a dc value of 6V. Find the rms value of $s_0(t)=s(t)-6$, *i.e.*, when the dc component is removed. (10%)

2. Under no-load condition a dc generator has a terminal voltage of 120V. When delivering its rated current of 40A, the terminal voltage drops to 112V. Find the Thévenin and Norton equivalent circuits of the generator. (10%)

3. Work equal to 136 joules is expended in moving 8.5×10^{18} electrons between two points in an electric circuit. What potential difference does this establish between the two points? (10%)

4. A unit of power used for electric motors is the *horsepower* (hp), equal to 746 watts. How much energy does a 5-hp motor deliver in two hours? Express the answer in MJ. (10%)

5. For the coupled circuit shown in Fig. 1, find the input impedance at terminals *ab*. (10%)

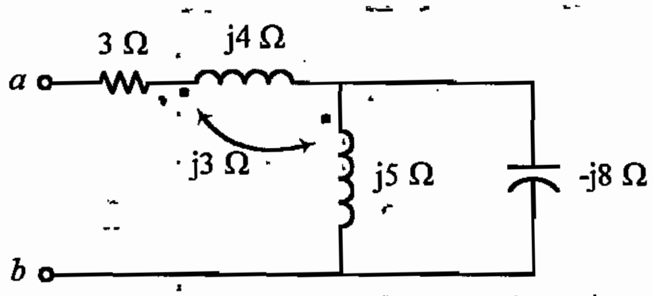

Fig. 1

6. A three-element circuit consists of $R=5\Omega$ in series with a parallel combination of L and C. At $\omega=500$ rad/s, $X_L=2\Omega$, $X_C=8\Omega$. Find the total current if the applied voltage is given by $v = 50+20\sin 500t+10 \sin 1000t$ (V). (15%)

7. Find the Z-parameters of the two-port circuit shown in Fig. 2. (15%)

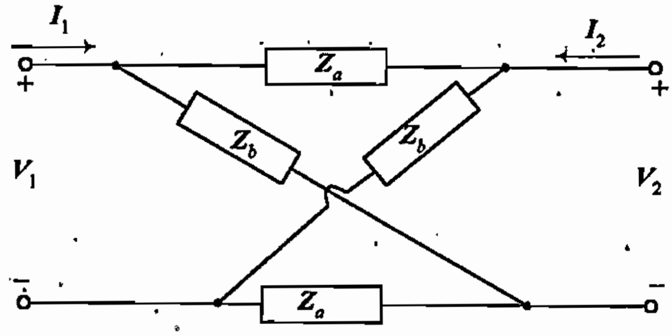

Fig. 2

8. The circuit shown in Fig. 3 is in resonance for two values of C when t
of the driving voltage is 5000 rad/s.
(a) Find these two values of C. (10%)
(b) Sketch the admittance locus diagram as the value of C varies fro
illustrate this fact. (10%)

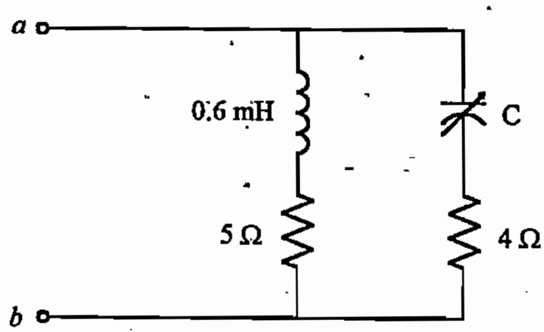

Fig. 3

國立雲林科技大學
九十一學年度研究所碩士班入學考試試題
系所：電機系
科目：電力電子學

1. Figure 1, the switch is turned on whenever $V_{ac} > V_{peak}/2$, and turned off one-half cycle later. Please give the average output voltage. (20%)

2. Please give the circuit of Cuk converter and give the relationship between average input and average output (need derive it). (20%)

3. A buck converter is used for a telephone switch system. This system requires 5V at levels between 50W and 500W. The source is a nominal 48V bus. The bus might vary by $\pm 20\%$. Select the output capacitor value to provide maximum output ripple of $\pm 1\%$. (Assume that Pin=Pout, switching frequency is 50kHz, L=50μH, and ESR of output capacitor is neglected) (20%)

4. Figure 2 is an ac regulator with a resistive load. α is the delay angle. What is the output RMS voltage? (10%) This ac regulator is used for a baseboard electric heater. The heater provides up to 5kW output with 240V input. What is the output power as a function of delay angle for this application? (10%)

5. Figure 3 is a general m-phase midpoint rectifier, what is the average value of $v_d(t)$? (20%)

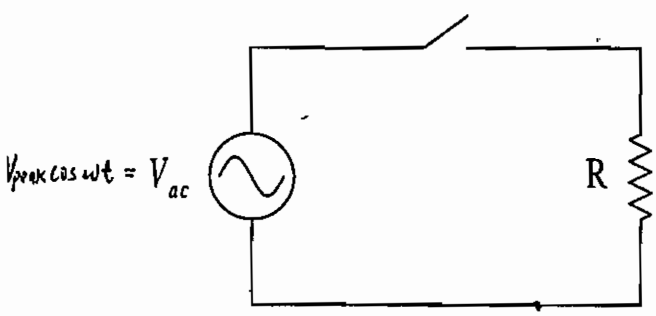

Figure 1

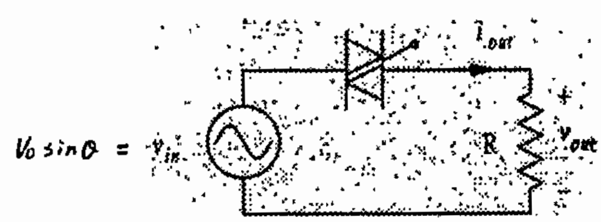

Figure 2

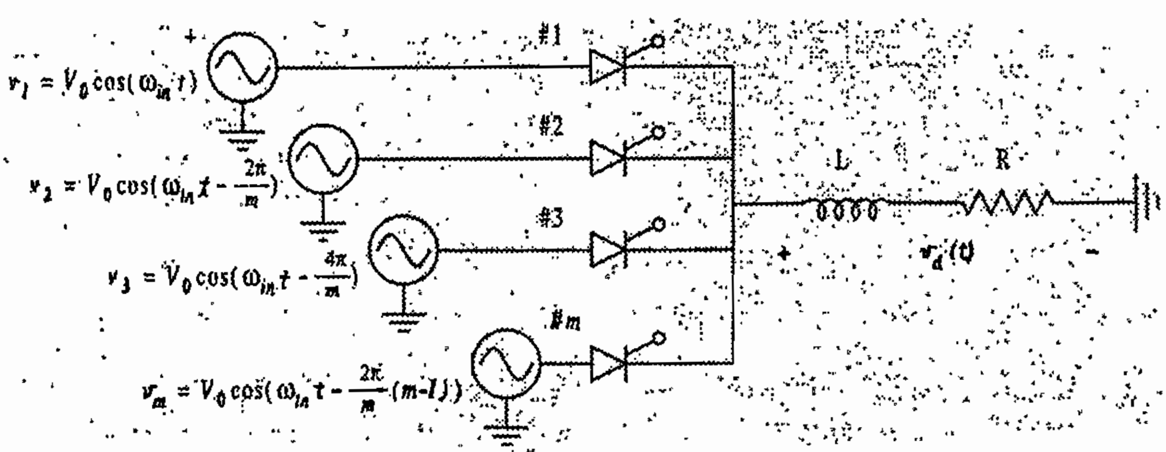

Figure 3

國立雲林科技大學
九十一學年度研究所碩士班入學考試試題

系所：電機系
科目：電力系統

1. An area of an interconnected power system has two fossil-fuel units operating on economic dispatch. The variable operating costs of these units are given by

$$C_1 = \begin{cases} 2P_1 + 0.02P_1^2 & \text{for } 0 < P_1 \le 100 \text{ MW} \\ 6P_1 \ \$/\text{hr} & \text{for } P_1 > 100 \text{ MW} \end{cases}$$

$$C_2 = 0.03P_2^2 \ \$/\text{hr}$$

and the units are subject to the following inequality constraints:

$$100 \le P_1 \le 500 \text{ MW}$$

$$50 \le P_2 \le 300 \text{ MW}$$

where P_1 and P_2 are in megawatts.

(a) Determine the power output of each unit, the incremental operating cost, and the total operating cost C_T that minimizes C_T as the total load demand $P_T = 700$ MW. (10%)

(b) Rework part (a) if total transmission losses for the power system are given by

$$P_L = 2\times10^{-4}P_1^2 + 1\times10^{-4}P_2^2 \text{ MW}. \ (10\%)$$

2. A 1000-kVA, 24.94 kV-480Y/277 V, three-phase distribution transformer has taps on the high side at nominal, ±2.5%, and ±5%. The transformer impedance is 1%+*j*6%. The actual high-side voltage is 24.2 kV phase to phase. Calculate the following:

(a) Actual voltages on the low-voltage side under no-load conditions for each tap setting. (10%)

(b) Actual voltages on the low-voltage side at full-load 0.9 lagging power factor for each tap setting. (10%)

3. For the system shown in Figure 1, directional overcurrent relays are used at breakers B12, B21, B23, B32, B34 and B43. Overcurrent relays alone are used at B1 and B4.

(a) For a fault at P_1, which breakers do not operate? Which breakers should be coordinated? (5%)

(b) Repeat (a) for a fault at P_2. (5%)

(c) Repeat (a) for a fault at P_3. (5%)

(d) Explain how the system is protected against bus faults. (5%)

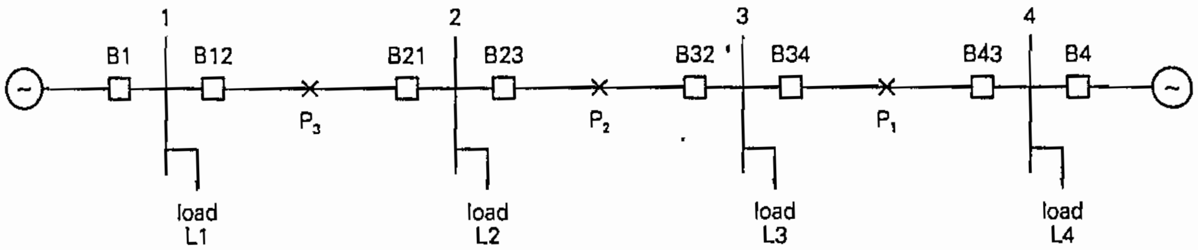

Figure 1

國立雲林科技大學 系所：電機系
九十一學年度研究所碩士班入學考試試題 科目：電力系統

4. Two balanced Y-connected loads, one drawing 10 kW at 0.8 lagging power factor and the other 15 k at 0.9 leading power factor, are connected in parallel and supplied by a balanced three-pha Y-connected, 480-V source.
   (a) Determine the source current. (10%)
   (b) If the load neutrals are connected to the source neutral by a zero-ohm neutral wire through ammeter, what will the ammeter read? (5%)

5. Show that the total instantaneous power delivered by a three-phase generator under balanced operati conditions is not a function of time, but a constant. (15%)

6. Determine the 4×4 bus admittance matrix for the circuit shown in Figure 2. (10%)

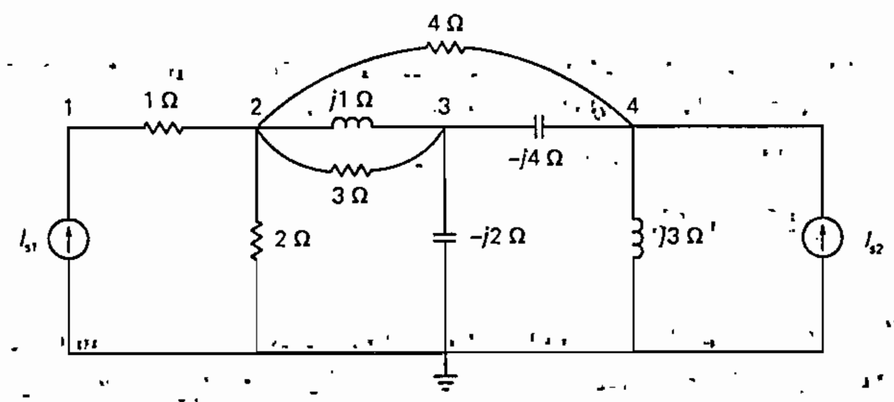

Figure 2

國立雲林科技大學
九十一學年度研究所碩士班入學考試試題

系所：電機系
科目：工程數學(乙)

1. Find the general solution for the following differential equations. (20 %)
   (a) $y^2 - 6xy + (3xy - 6x^2)y' = 0$. (10 %)
   (b) $y'' + 9y = x\cos(3x)$. (10 %)
2. There are two solutions that are solved for the equation, $y'' + xy = 0$, in the power series,

$$y_1(x) = 1 - \frac{1}{6}x^3 + \frac{1}{180}x^6 - \frac{1}{12960}x^9 + \ldots$$

$$y_2(x) = x - \frac{1}{12}x^4 + \frac{1}{504}x^7 - \frac{1}{45360}x^{10} + \ldots$$

   Can you verify the solutions are linearly independent ? (10 %)
3. Find the Laplace transform for the following function (10 %)
   $f(t) = e^t[1 - \cosh(2t)]$.
4. Find the inverse Laplace transform for the following function. (10 %)

$$F(s) = \frac{se^{-s}}{(s^2+4)^2}$$

5. Find the steady-state solution $y(t)$ of $y'' + 0.02y' + 25y = r(t)$, where

$$r(t) = \begin{cases} t + \frac{\pi}{2} & \text{if } -\pi < t < 0, \\ -t + \frac{\pi}{2} & \text{if } 0 < t < \pi, \end{cases} \quad \text{and } r(t+2\pi) = r(t). \qquad (10\%)$$

6. True or false. Give a reason or a counterexample.
   (a) If the columns of a matrix are linearly dependent, so are the rows. (3%)
   (b) A symmetric matrix times a symmetric matrix is symmetric. (3%)
   (c) The inverse of a symmetric matrix, if exists, is symmetric. (3%)
   (d) Let A, B be $n \times n$ matrices. If $AB = B$, then $A = I$ (I is the $n \times n$ identity matrix). (3%)
7. The complete solution to $A\mathbf{x} = \begin{bmatrix} -3 \\ 3 \end{bmatrix}$ is $\mathbf{x} = \begin{bmatrix} 3 \\ 0 \end{bmatrix} + c\begin{bmatrix} 0 \\ 2 \end{bmatrix}$, $c \in \mathbf{R}$. Find A. (10%)
8.
   (a) Find a basis for the subspace W_1 of vectors $[a,b,c,d]^T$ with $a + c + d = 0$ (6%)
   (b) Find a basis for the subspace W_2 of vectors $[a,b,c,d]^T$ with $a + b = 0$ and $c = 2d$. (6%)
   (c) What is the dimension of the intersection $W_1 \cap W_2$. (6%)

國立雲林科技大學
九十一學年度研究所碩士班入學考試試題

系所：電機系
科目：電子學

1. For the circuit in Fig. 1, $I_{C1}=1\,\text{mA}$, V_{CC}=15V, and the transistors have $\beta=150$.

(a) Determine R. (10%)

(b) Determine the percentage change in I_{C1} for a 50°C change in temperature if V_{BE} changes by 2.2mV/°C and all other parameters are unchanged. (15%)

2. The enhancement transistors in the circuit of Fig. 2 have $I_D=100(V_{GS}-3)^2\,\mu\text{A}$. The depletion transistor has $I_D=100(V_{GS}+1)^2\,\mu\text{A}$. Determine I_{D1}. (25%)

3. The transfer function of a circuit is given by

$$T(s)=\frac{2\times10^{-3}s^3}{(1+s)(1+s/100)(1+s/1000)}$$

(a) What are the gain and phase margins? (15%)

(b) Is the system stable? (10%)

4. Determine the transfer gain $\dfrac{V_o(s)}{V_s(s)}$ for the circuit in Fig. 3. (25%)

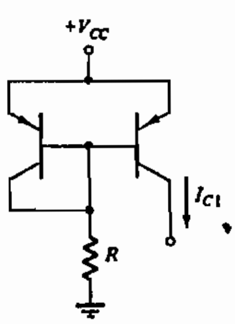

Fig. 1

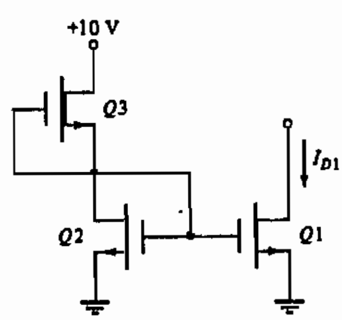

Fig. 2

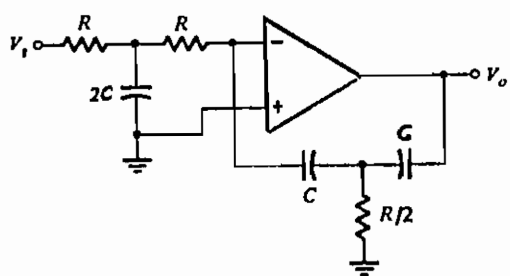

Fig. 3

國立雲林科技大學
九十一學年度研究所碩士班入學考試試題

系所：電機系
科目：自動控制

1. Give the definitions (or the concepts) for the following terminologies. (20%)
   (a) state controllable. (5%) (b) linear time-invariant systems. (5%)
   (c) gain margin. (5%) (d) root loci of linear systems. (5%)

2. For the following circuit shown in Figure 1, solve the following problems. (30%)
   (a) Write the state equations and output equation, where the state variables are X_1, X_2, and X_3, the input variable is $u(t)$ and the output variable is $y(t)$. (10 %)
   (b) Write the transform function, $G(s)=\dfrac{y(s)}{u(s)}$. (10 %)
   (c) Find the zero-state response of y(t) for $C_1=\dfrac{1}{10}F, C_2=1F, L=1H$
   $R=\dfrac{1}{10}\Omega$ and u(t) = H(t), where H(t) is Heaviside function. (10 %)

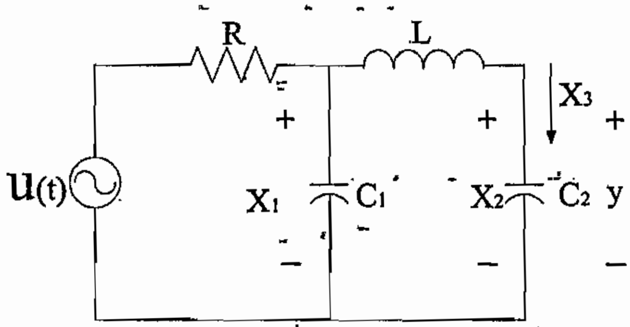

Figure 1

3. Use the root-locus method to show that
   (a) the polynomial s^3+s^2+s+2 has one real root in the interval $(-2,-1)$ and a pair of complex-conjugate roots with real part in $(0,1)$. [*Hint*: Write the polynomial as $s^3+s^2+K(s+2)$ with $K=1$] (10%)
   (b) the polynomial $s^5+2s^4-15s^3+s^2-2s-15$ has three real roots in the intervals: $(3, 5)$, $(-3, 0)$, $(-\infty, -5)$, and a pair of complex conjugate roots with positive real part. [*Hint*: Write the polynomial as $s^5+2s^4-15s^3+K(s^2-2s-15)$ with $K=1$] (10%)

4. Consider a plant with transfer function $G(s)=\frac{2}{(s+1)(s-1)}$. We want to design a controller $C(s)$ such that the closed-loop transfer function from the input r to the output y is

$$G_o(s)=\frac{2}{s^2+2s+2}.$$

   (a) If we implement $G_o(s)$ in the unity-feedback configuration, shown in Figure 2, find $C(s)$. (10%)

   (b) Give a reason why the implementation in Part (a) is practically unacceptable. (5%)

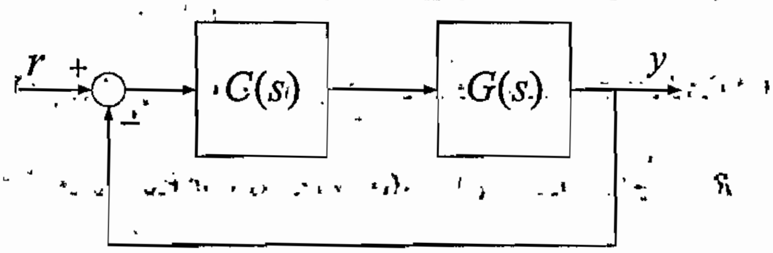

Figure 2

5. Consider a plant with transfer function

$$G(s)=\frac{1}{s^2-1}$$

Design a proper compensator of degree 1: $C(s)=\frac{\alpha_1+\beta_1 s}{\alpha_0+\beta_0 s}$, and a gain K such that the closed-loop system in Figure 3 has all (three) poles located at -2 and the output y will track asymptotically step reference inputs (r). (15%)

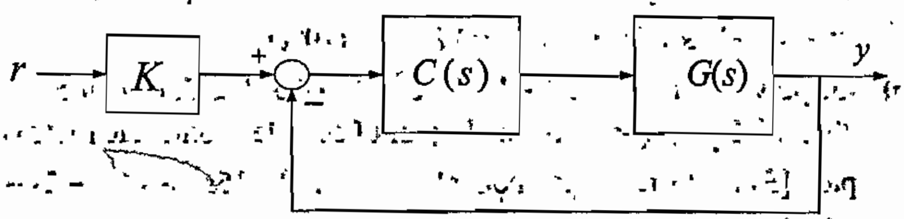

Figure 3

國立雲林科技大學
九十一學年度研究所碩士班入學考試試題

系所：電機系
科目：線性代數與機率

1. (16%) Which of the following vectors in R_4 are linear combinations of $\mathbf{v}_1=[1,2,1,0]$, $\mathbf{v}_2=[4,1,-2,3]$, $\mathbf{v}_3=[1,2,6,-5]$, $\mathbf{v}_4=[-2,3,-1,2]$, explain your answer.
   (a) [3,6,3,0] (b) [1,0,0,0] (c) [3,6,-2,5] (d) [0,0,0,1]

2. (17%) Let $L: R_4 \rightarrow R_3$ be defined by $L([a, b, c, d])=[a+b, c+d, a+c]$.
   Find a basis for range L.

3. (17%) Determine the singular value decomposition of $A=\begin{bmatrix} 1 & -4 \\ -1 & 2 \\ 2 & 4 \end{bmatrix}$

4. (25%) 一個信號有 N 個 bytes， N 是幾何分佈其參數為(1-p)，亦即，
$p[N=k]=(1-p)p^k$，且 N 之樣本空間為 $S_N=\{0,1,2,\cdots\}$。假定所有信號都要被切割以形成封包(packets)，封包的最大長度是 M bytes。 令 Q 是一個完全封包(M bytes)的數目，R 是剩下的 bytes 的數目(未滿 M bytes 而形成一個不完全封包)。試求：
10% (a) Find the joint probability mass function of R & Q, i.e., P[Q=s, R=r]=?.
10% (b) Find the marginal probability mass functions of R and Q, respectively.
5% (c) Are R & Q independent? Verify that.

5. (25%) 兩個事件 A 及 B，P(A)及 P(B)>0.
   5% (A) 下面那個條件不能判定 A 及 B 是獨立的 (1) $P(A\cap B)=P(A)P(B)$ (2) $P(A|B)=P(A)$
   (3) $P(A|B)=P(B|A)$ (4) $P(A|B^c)=P(A|B)$ (5) 以上皆可判定
   5% (B) 若 A 及 B 是互斥事件且知 P(A)及 P(B)之值，則 P(AUB)=?
   5% (C) 若 A 及 B 是獨立的且知 P(A)及 P(B)之值，則 P(AUB)=?
   10% (D) 若 P(A|B)>P(A)是否可判斷 P(B|A)>P(B)? 請說明理由。若知 P(A|B)<=P(A)你可作何結論？

國立雲林科技大學
九十一學年度研究所碩士班入學考試試題

系所：電機系
科目：計算機概論

1. 請說明何謂"奇同位元檢查"(odd parity check)，舉一例說明之。(5%)

2. 請採用 2 的補數計算
   (a) (011001)2 – (000101)2。(5%)
   (b) (1001)2 – (11101)2。(5%)

3. CPU 內部包含那些重要的暫存器? 請繪出 CPU 簡單的結構圖 (以上述暫存器為主)，並說明其執行指令的工作原理。(15%)

4. 若實數 x 之近似值為 X，d 為滿足 $|x-X|\le 10^{-d}$ 的最大正整數，r 為滿足 $\left|\frac{x-X}{x}\right|\le 10^{-r}$ 的最大正整數，則 d 與 r 分別代表 x 與 X 之間近似程度的何種意義? (試以 x = 1/90，X = 0.0111 為例說明之) (20%)

5. (a) 請用真值表(truth table)的方式來證明數位系統中的 DeMorgan's laws。(4%)
   (b) 請證明 $AB+A'C=(A+C)(A'+B)$。(4%)

6. 請解釋下列名詞。
   (a) Binary Search Tree。(3%)
   (b) Complete Binary Tree。(3%)
   (c) Biconnected Graph。(3%)
   (d) Internet。(3%)
   (e) HTML。(3%)
   (f) URL。(3%)

7. 給定一個圖形
   (a) 請說明何謂拓樸順序(topological order)。(3%)
   (b) 請寫出拓樸排序法(topological sort)的演算法。(4%)
   (c) 請用圖 1 當作輸入來說明你所寫的演算法。(3%)

8. 請用 {26, 5, 77, 1, 61, 11, 59, 15, 48, 19} 當作輸入來說明何謂合併排序法 (merge sort)。(6%)

9. 請解出下列方程式。(8%)

$T(n) = T((1-f)n) + O(n^k)$，　$0 < (1-f) < 1$，k 為一常數。

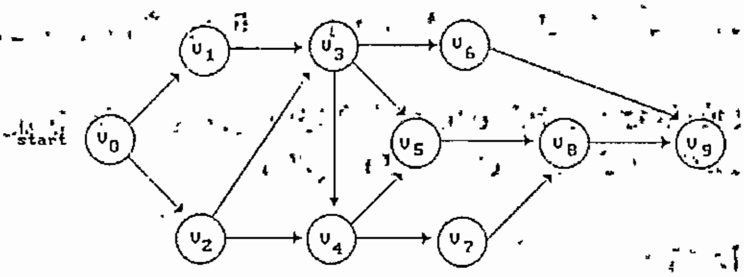

圖 1

國立雲林科技大學
九十一學年度研究所碩士班入學考試試題
系所：電機系
科目：通信理論

1. (20%) A PCM (pulse coded modulation) system uses a uniform quantizer followed by an 8-bit binary encoder. The bit rate of the system is equal to 64×10^6 bit/second.

(a) (10%) What is the maximum message bandwidth for which the system operates satisfactorily?

(b) (10%) Determine the output signal-to-(quantization) noise ratio (in dB value) when a full-load sinusoidal modulating wave of frequency 1 MHz is applied to the input.

2. (20%) Consider the signal $x(t)=\sum_{k=-\infty}^{\infty}\frac{\sin(k\frac{\pi}{4})}{k\frac{\pi}{4}}\delta(t-k\frac{\pi}{4})$.

(a) (5%) Determine $g(t)$ such that $x(t)=(\frac{\sin t}{\pi t})g(t)$.

(b) (15%) Use the multiplication property of the Fourier transform to argue that $X(jw)$ is periodic. Specify $X(jw)$ over one period.

(Hint: $\mathrm{FT}\{\sum_{n=-\infty}^{\infty}\delta(t-nT)\}=\frac{2\pi}{T}\sum_{-\infty}^{\infty}\delta(w-\frac{2\pi k}{T})$, where FT denotes Fourier transform.)

3. (10%) What absolute bandwidth is required to transmit an information rate of 8.0 kb/s using 64-level baseband signaling over a raised cosine channel with a roll-off factor of 50%?

4. (20%) The signaling of a binary system uses the following pulses to represent the equally probable symbols 1 and 0, respectively.

$$s_1(t)=A,\qquad 0<t<T_b,$$
$$s_0(t)=-2A,\qquad 0<t<T_b,$$

where T_b is the bit duration. Assume the signal is transmitted through an AWGN channel with $N_0/2$ noise power spectral density.

(a) (10%) Sketch the block diagram of the receiver for baseband transmission of the binary wave. Be sure to give the impulse response of the matched filter and the decision threshold.

(b) (10%) Determine the conditional error probability when $s_1(t)$ is transmitted.

國立雲林科技大學
九十一學年度研究所碩士班入學考試試題

系所：電機系
科目：通信理論

5. (20%) The modulated signals in a quaternary system are given b $s(t) = a\cos(2\pi f_c t) + b\sin(2\pi f_c t)$, for $0 \le t < T$, where $a = \pm 1$ and $b = \pm 2$. Assume the signals are transmitted through an AWGN channel with $N_0/2$ noise power spectr density.

(a) (5%) Plot the signal-space diagram for the signals.

(b) (10%) It can be noted that each transmitted symbol carries two-bit information. I Gray encoding the transmitted symbols, determine the transmission err probabilities for the first and the second bit, respectively.

(c) (5%) You might have observed that the two bits have different error rates. Descri possible applications of such signal constellation.

6. (10%) It is known that the baseband power spectral density of an M-ary PSK signa given by $S_B(f) = 2E_b \log_2 M \operatorname{sinc}^2(T_b f \log_2 M)$, where T_b is the bit durati Starting from this equation, determine the bandwidth efficiency ρ for $M = 2, 4, 8,$ and 32, respectively.

國立雲林科技大學
九十一學年度研究所碩士班入學考試試題

系所：電機系
科目：科技英文

I.(30%) Reading comprehension 1

(1)Current moves from a point of high potential energy to one of low potential. It can only do so if there is a path for it to follow. This path is called an electric circuit. All circuits contain four elements: a source, a load, a transmission system and a control.

The source provides the electromotive force. This establishes the difference in potential which makes current flow possible. The source can be any device which supplies electrical energy. For example, it may be a generator or a battery.

The load converts the electrical energy from the source into some other form of energy. For instance, a lamp changes electrical energy into light and heat. The load can be any electrical device.

The transmission system conducts the current round the circuit. Any conductor can be part of a transmission system. Most systems consist of wires. (2)It is often possible, however, for the metal frame of a unit to be one section of its transmission system. For example, the metal chassis of many electrical devices are used to conduct current. Similarly the body of a car is part of its electrical transmission system.

The control regulates the current flow in the circuit. (3)It may control the current by limiting it, as does a rheostat, or by interrupting it, as does a switch.

Study figure 1. In this simple flashlight circuit, the source comprises three 1.5V cells in series. The load is a 0.3W bulb. Part of the transmission system is the metal body of the flashlight, and the control is a sliding switch.

Compare figure 2. The function of this circuit is to operate a television camera aboard a space satellite. Here the source is a battery of solar cells. A solar cell is an electric cell which converts sunlight into electrical energy. The load is the television camera. The transmission system is the connecting wires. The control is a relay actuated by transmissions from ground control. Although the function of this circuit is much more complex than that of the flashlight, it too consists of the four basic elements.

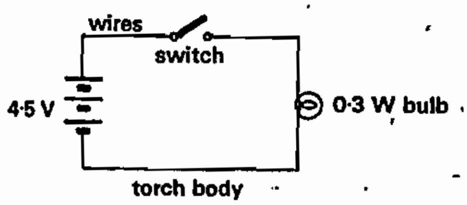

FIGURE 1

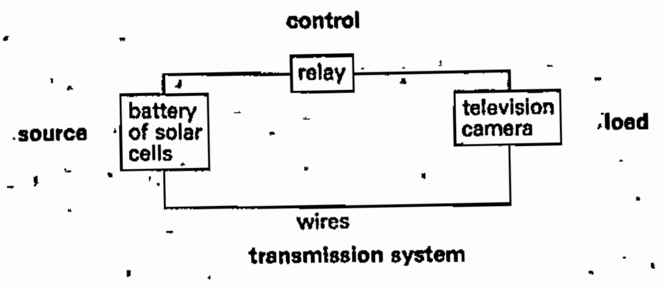

FIGURE 2

A. What do the pronouns in boldface in these sentences referred to?

1. Current moves from a point of high potential energy to **one** of low potential. (4%)

   (a) current (b)energy (c)a point (c)potential

2. It is often possible, however, for the metal frame of a unit to be one section of **its** transmission system. (5%)

(a) the metal frame's (b) the unit's (c) the circuit's (d) the conductor's

3. It may control the current by limiting it, as does a rheostat, or by interrupting it, as switch. (5%)

(a) current (b) control (c) current flow (d) circuit

B. Decide if these statements are true or false. Quote from the passage to support your d

1. A difference in potential is required before current can flow in a circuit. (2%)
2. A generator is a source of electromotive force. (2%)
3. The current flow in the satellite circuit is regulated by a relay. (2%)
4. Transmission systems must consist of wires. (2%)
5. The flashlight circuit differs basically from the satellite circuit. (2%)
6. A rheostat may be used as a control. (2%)
7. The source in the satellite circuit is a solar cell. (2%)
8. The load in the flashlight circuit is a bulb. (2%)

II. (40%) Reading comprehension 2

If two crystals of a semiconductor material, one of p-type and one of n-type, are joine together, a pn junction is formed. This junction can be used as a rectifier and is known as a junction diode.

Figure 3 illustrates what happens when a voltage is applied across a silicon pn junctio The first quadrant of the graph shows the **characteristics** of the diode when the source is c with the positive to the p-side of the junction and the negative to the n-side. In other words diode is forward biased. With forward bias, the current will continue to rise with increased but eventually a point will be reached where the diode is destroyed by heat.

The third quadrant shows the characteristics when the source is connected with the po the n-side and the negative to the p-side. When the diode is reverse biased, there is almost current flow. The junction is therefore a good rectifier: it conducts well in one direction and almost not at all in the other. However there is a small reverse leakage current. This leakage current remains **substantially** constant until what is known as breakdown voltage (Vb) is reached. At this point there is a **sharp** increase in the reverse current. This sudden increase is called the Zener effect.

Normal diodes are never operated in the breakdown region but Zener diodes are designed to make use of the breakdown **phenomenon**. Because any slight increase in voltage beyond the breakdown point causes a large increase in current. Zener diodes are often used as a kind of overspill to protect sensitive circuits from **fluctuations** in the power supply.

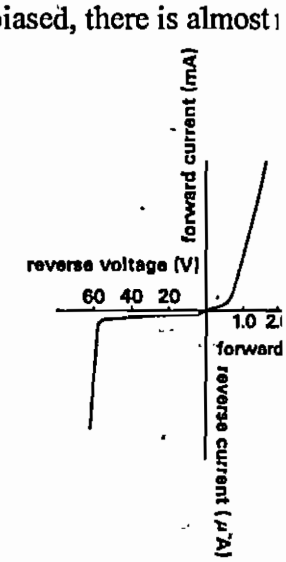

FIGURE 3

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九十一學年度研究所碩士班入學考試試題

系所：電機系
科目：科技英文

A. Select a word from the three alternatives given which is most similar in meaning to the word in boldfaces as it is used in the passage: (20%)

1. **characteristics**
   (a) typical behavior (b) voltage figures (c) graph
2. **Substantially**
   (a) almost (b) greatly (c) hardly
3. **Sharp**
   (a) slight (b) steep (c) cutting
4. **Phenomenon**
   (a) voltage (b) effect (c) result
5. **Fluctuations**
   (a) rises and falls (b) increases (c) failures

B. Complete this description of the current-voltage characteristics of a silicon diode. Use the passage and Figure 3 to help you. (10%)

(例 1): the current increases slowly.

At first, when a forward voltage is applied, …(例 1). When the forward voltage has reached about 600 mV, …(1). If the forward voltage is further increased, …(2). …(3)only a very small leakage current flows. When the breakdown voltage is reached, …(4). After the breakdown point, any further increase in reverse voltage causes…(5).

C. Decide if these statements are true or false. Quote from the passage to support your decisions. (10%)

1. The first quadrant of the graph shows the characteristics of the diode in forward bias.
2. For forward voltages over 600mV, the diode conducts well.
3. When the source is connected with the negative to thc n-side and the positive to the p-side, the diode conducts badly.
4. When a reverse voltage is first applied, a diode conducts badly.
5. Zener diodes are never used beyond breakdown point.

III. (30%)英翻中

1. The development of clectrical engineering and computer science has traditionally involved the combined efforts of persons with a wide range of skills and interests, and future development will demand further cross-disciplinary collaboration. (15%)

2. Photovoltaic(PV, 太陽光發電) gives us domestic reserves of energy that we will never deplete. PV semiconductor materials are abundant. And sunshine, the "fuel" for PV, is something we can never overtax or squander. (15%)

國立雲林科技大學
九十一學年度研究所碩士班入學考試試題

系所：電機系
科目：工程數學(乙)

(1) Find the solution for the following equation. (15%)

$$\frac{dy}{dx}+y=x,\quad y(0)=4$$

(2) Find the general solution for the following differential equation.

$$y''-2y'-3y=4x-5+6xe^{2x}$$ (20%)

(3) Find the following problem by using the Laplace Transform. (15%)

$$y''-6y'+9y=t^2e^{3t},\quad y(0)=2,\quad y'(0)=17$$

(4) Solve the integral equation $f(t)=3t^2-e^{-t}-\int_0^t f(\tau)e^{t-\tau}d\tau$ (15%)

(5) Find values of a, b, and c such that the following system of linear equations has
(i) exactly one solution, (5%)
(ii) an infinite number of solutions, (5%)
(iii) no solution. (5%)

$$\begin{aligned} x+5y+z&=0\\ x+6y-z&=0\\ 2x+ay+bz&=c \end{aligned}$$

(6) $A=\begin{bmatrix}1 & -4\\ -2 & 8\end{bmatrix}$

(i) Find the eigenvalues and corresponding eigenvectors of A. (10%)
(ii) If possible, find a matrix P and D such that $D=P^{-1}AP$ is diagonal. (10%)