



1. For the circuit of Fig. 1, the switch is closed at $t=0$. Obtain the current $i_1(t)$ for $t > 0$. (20%)

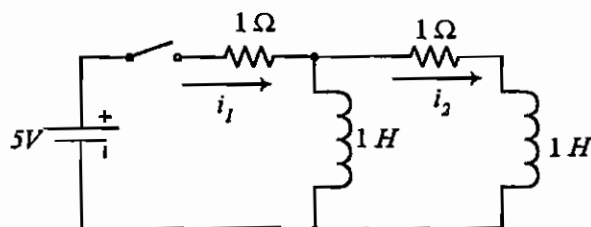


Fig. 1

2. For the network of Fig. 2, obtain the current ratio I_1/I_3 . (10%)

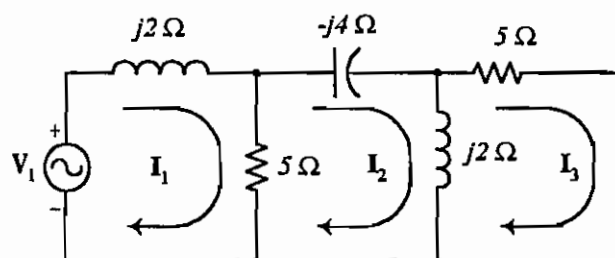


Fig. 2

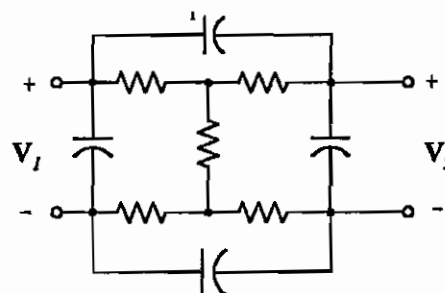


Fig. 3

4. A pure inductance, $L=10\text{mH}$, has an applied voltage with the waveform shown in Fig. 4, where $\omega=200\text{ rad/s}$. Obtain the trigonometric Fourier series for the current flowing in the inductance. (20%)

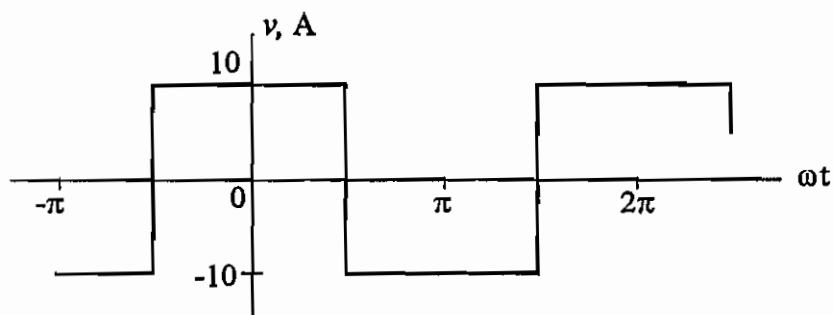


Fig. 4



5. Find V_2 in the circuit of Fig. 5, in which an ideal transformer of turns ratio 5:2 is used. (15%)

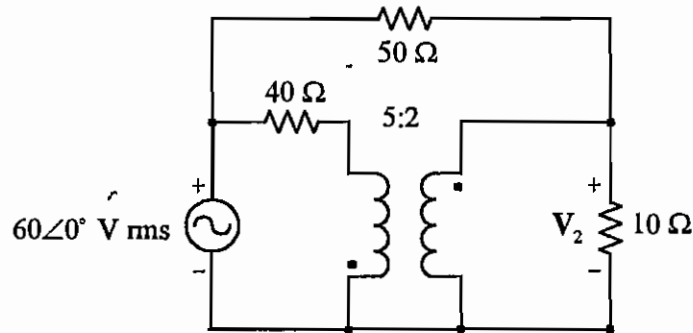


Fig. 5

6. (a) Find both wattmeter readings in Fig. 6 if $V_A = 100 \angle 0^\circ$ V rms; $V_B = 50 \angle 90^\circ$ V rms, $Z_A = 10 - j10 \Omega$, $Z_B = 8 + j6 \Omega$, and $Z_C = 30 + j10 \Omega$. (15%) (b) Is the sum of these readings equal to the total power taken by the three loads? (5%)

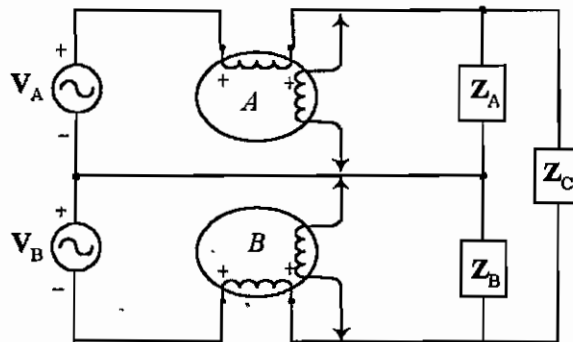


Fig. 6



1. Express the waveform in Fig.1 in Fourier series. (20%)

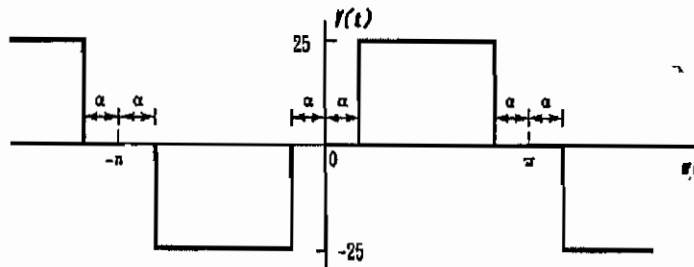


Fig.1

2. A sinusoidal voltage source of $v(t) = 120\cos(377t)$ V is applied to a nonlinear load, resulting in a non-sinusoidal current is expressed in Fourier series form as $i(t) = 10 + 16\cos(377t + 30^\circ) + 6\cos(2 \cdot 377t + 45^\circ) + 4\cos(3 \cdot 377t + 60^\circ)$ A. Determine (a) the power absorbed by the load, (b) the power factor of the load, (c) the distortion factor of the load current, and (d) the total harmonic distortion of the load current. (20%)
3. Determine (a) the input to output voltage transfer ratio of the Fly-back converter (Fig.2) operated in continuous conduction mode and with a duty ratio of D , (b) the voltage stress of S and D_1 . (20%)

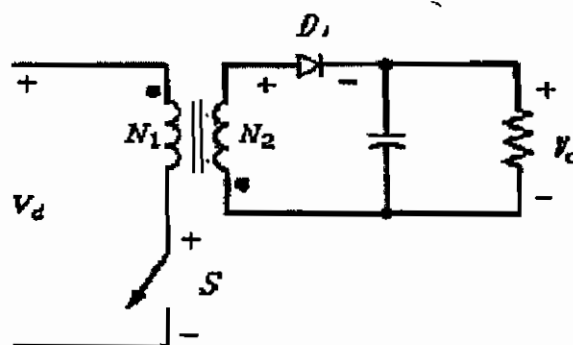


Fig.2

4. Fig. 3 shows the general m -phase midpoint rectifier. Connect each of the m sources for time T/m , so that the switch duty ratios are all $1/m$. Calculate the average voltage of V_d . (delay angle is α) (20%)



5. A buck converter provides 48V to 5V conversion at a nominal power level of 100W. If the switching frequency is 100 kHz, what is the critical inductance for this converter? (20%)

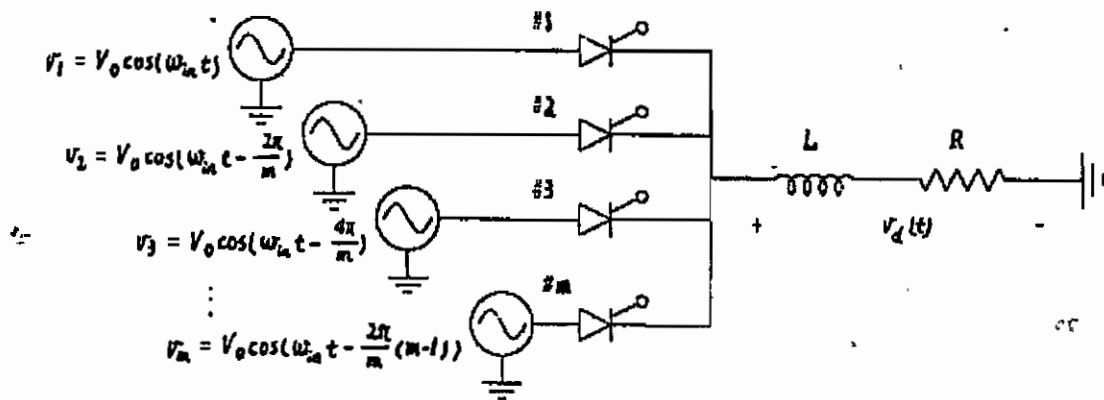


Fig. 3

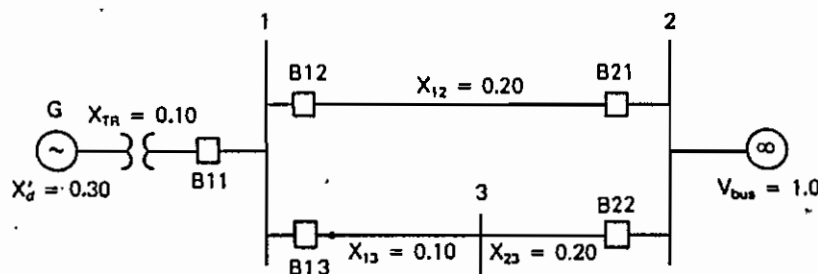


1. Figure 1 shows a single-line diagram of a three-phase, 60-Hz synchronous generator, connected through a transformer and parallel transmission lines to an infinite bus. All reactances are given in per-unit on a common system base. If the synchronous generator delivers 0.9 per-unit real power at 1.08 per-unit terminal voltage, determine

- the reactive power output of the generator,
- the generator internal voltage, and
- an equation for the electrical power delivered by the generator versus power angle δ .

(25%)

Figure 1



2. Equipment ratings and per-unit reactances for the system shown in Figure 2 are given as follows:

Synchronous generators:

G1	100 MVA	25 kV	$X_1 = X_2 = 0.2$	$X_0 = 0.05$
G2	100 MVA	13.8 kV	$X_1 = X_2 = 0.2$	$X_0 = 0.05$

Transformers:

T1	100 MVA	25/230 kV	$X_1 = X_2 = X_0 = 0.05$
T2	100 MVA	13.8/230 kV	$X_1 = X_2 = X_0 = 0.05$

Transmission lines:

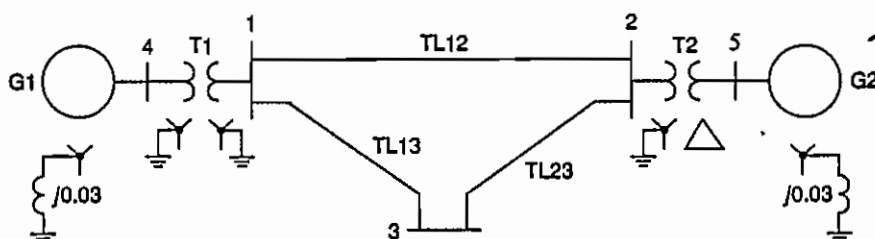
TL12	100 MVA	230 kV	$X_1 = X_2 = 0.1$	$X_0 = 0.3$
TL13	100 MVA	230 kV	$X_1 = X_2 = 0.1$	$X_0 = 0.3$
TL23	100 MVA	230 kV	$X_1 = X_2 = 0.1$	$X_0 = 0.3$

Using a 100-MVA, 230-kV base for the transmission lines,

- draw the per-unit sequence networks and reduce them to their Thévenin equivalents, "looking in" at bus 3. Neglect $\Delta - Y$ phase shifts.
- Compute the fault currents for a bolted three-phase fault at bus 3.
- Compute the fault currents and voltages at the fault for a bolted single line-to-ground fault at bus 3.

(25%)

Figure 2





3. A 60-Hz, 100-mile, three phase overhead transmission line, constructed of ACSR conductors, has a series impedance of $(0.1826 + j0.784) \Omega/\text{mi}$ per phase and a shunt capacitive reactance-to-neutral of $185.5 \times 10^3 \angle -90^\circ \Omega\text{-mi}$ per phase. Using the nominal π circuit for a medium-length transmission line,
- determine the total series impedance and shunt admittance of the line.
 - Compute the voltage, the current, and the real and reactive power at the sending end if the load at the receiving end draws 200 MVA at unity power factor and at a line-to-line voltage of 230 kV.
 - Find the percent voltage regulation of the line.
- (25%)
4. Two three-phase generators supply a three-phase load through separate three-phase lines. The load absorbs 30 kW at 0.8 power factor lagging. The line impedance is $(1.4 + j1.6) \Omega$ per phase between generator G1 and the load, and $(0.8 + j1) \Omega$ per phase between generator G2 and the load. If generator G1 supplies 15 kW at 0.8 power factor lagging, with a terminal voltage of 460 V line-to-line, determine
- the voltage at the load terminals,
 - the voltage at the terminals of generator G2, and
 - the real and reactive power supplied by generator G2. Assume balanced operation.
- (25%)



1. Find the general solution for each of the following differential equations.

(a) $\frac{dy}{dx} = \frac{2y+y \cos x}{2x+\sin x}$ (10%)

(b) $(3x-4)^2 \frac{d^2y}{dx^2} + 3(3x-4) \frac{dy}{dx} + 36y = 0$ (15%)

2. Find the inverse Laplace transform of the function $F(s) = \tan^{-1}\left(\frac{2}{s}\right)$. (10%)

3. Use the Laplace transformation to solve the following differential equation

$$y'(t) + 2y(t) = \begin{cases} t, & 0 \leq t < 1 \\ 0, & t \geq 1 \end{cases}, \quad y(0) = 0 \quad (15\%)$$

4. For what value(s) of α does the following system of equations have (i) no solution? (ii) a unique solution? (iii) infinitely many solutions?

$$\begin{aligned} x_1 - 2x_2 + 3x_3 &= 1 \\ 2x_1 + \alpha x_2 + 6x_3 &= 6 \\ -x_1 + 3x_2 + (\alpha - 3)x_3 &= 0. \end{aligned}$$

In cases (ii) and (iii), describe the general solution. (15%)

5. When $a + b = c + d$, show that $[1, 1]^T$ is an eigenvector and find both eigenvalues of

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}. \quad (15\%)$$

6. Let

$$A = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix} [2 \ 1 \ 2] = \begin{bmatrix} 2 & 1 & 2 \\ 4 & 2 & 4 \\ 2 & 1 & 2 \end{bmatrix}.$$

This matrix is singular with rank one. Find three eigenvalues and three linearly independent eigenvectors. (10%)

7. Suppose that f is a solution of $y'' - t^2y = y$. Show that $F\{f(t)\}$ is also a solution, where $F\{f(t)\} = \int_{-\infty}^{\infty} f(t)e^{-i\omega t} dt$ is the Fourier transform of f . (10%)



1. (10%) Find V_1 and V_o for the input conditions given in Fig. 1. Assume $V_\gamma = 0.7 \text{ V}$.
2. (20%) Assume $V_\gamma = 0$ and $r_f = 0$ for both diodes in Fig. 2. Plot the output of v_o .
3. (30%) Assume $\beta = 100$, $V_{BE(\text{on})} = 0.7 \text{ V}$, and $V_A = \infty$ for Q1 and Q2 in Fig. 3.
 - (a) Find the overall small-signal voltage gain $A_v = v_o / v_s$.
 - (b) Find the input and output resistances R_{is} and R_o .
 - (c) Determine the maximum undistorted swing in the output voltage.
4. (20%) Refer to the instrumentation amplifier shown in Fig. 4.
 - (a) Find the condition under which this circuit will act as a difference amplifier.
 - (b) Determine the gain, $A_d = v_o / (v_2 - v_1)$.
5. (20%) For the circuit shown in Fig. 5, the transistor parameters are: $k'_{n1} = 0.4 \text{ mA/V}^2$, $k'_{n2} = k'_{n3} = k'_{n4} = 0.2 \text{ mA/V}^2$, and $V_t = 1 \text{ V}$. Given $(W/L)_1 = (W/L)_3 = (W/L)_4 = 1$, please determine I_{REF} and $(W/L)_2$ so that $I_Q = 0.45 \text{ mA}$.

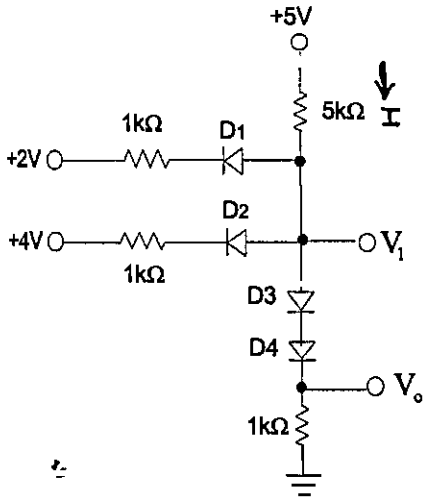


Fig. 1

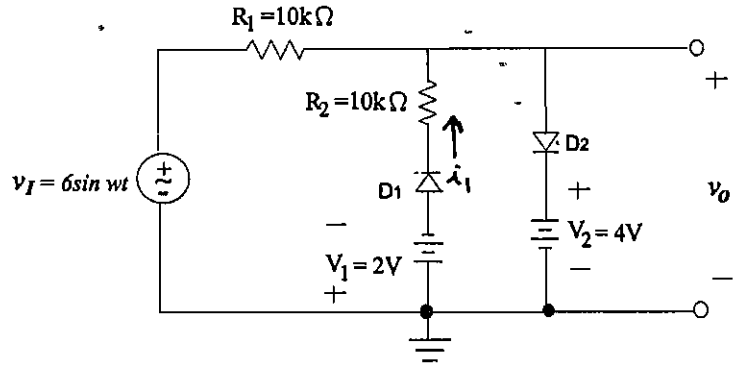


Fig. 2

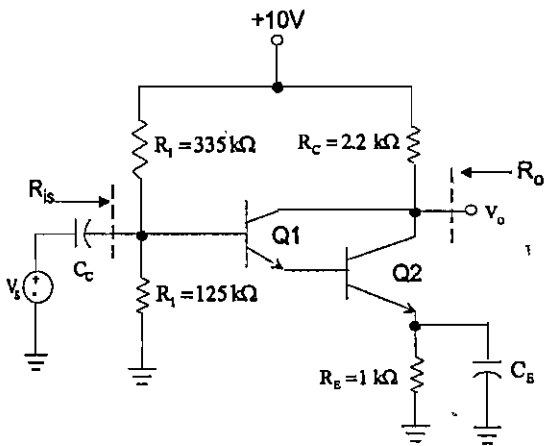


Fig. 3

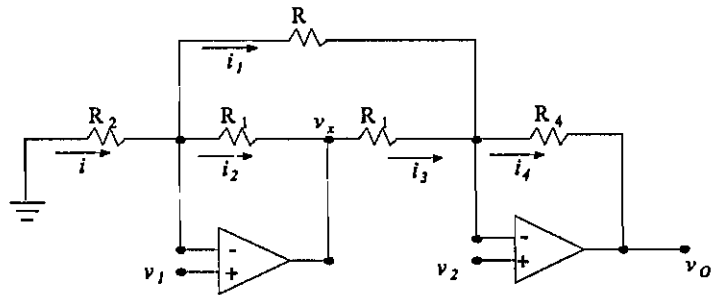


Fig. 4

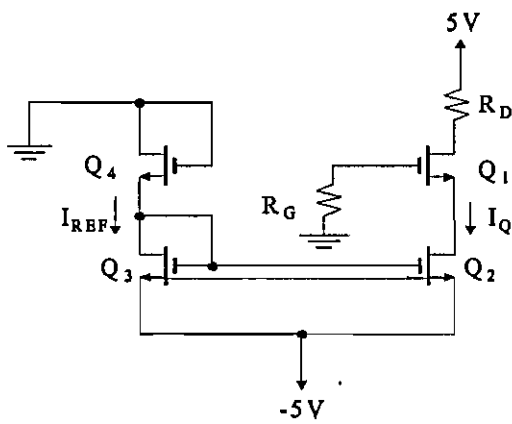


Fig. 5



1. Give the concepts (or definition) for the following terminologies. (20%)
 - (a) Nyquist criterion. (5%)
 - (b) Jury's stability test. (5%)
 - (c) settling time. (5%)
 - (d) PID compensator. (5%)

2. The dynamic system is described by

$$\dot{\underline{x}} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -2 & -5 & -4 \end{bmatrix} \underline{x} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u, \quad y = [1 \ 0 \ 1] \underline{x}. \quad (30\%)$$

- (a) Determine the characteristic equation. (10%)
- (b) Determine the transitional matrix, $\exp(At)$. (10%)
- (c) Find the transfer function. (10%)

3. Do the following problems for the unity feedback system with

$$G(s) = \frac{k}{(s+2)(s+5)(s+8)}. \quad (30\%)$$

- (a) Sketch the root locus. (10%)
- (b) Find the asymptotes. (10%)
- (c) The range of k for stability. (10%)

4. Determine if the system is stable for the following characteristic equation of the discrete-time system,

$$Q(z) = z^3 - 1.8z^2 + 1.05z - 0.2 = 0. \quad (10\%)$$

5. Find the solution for the following difference equation,

$$\underline{x}(k+1) = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \underline{x}(k); \quad \underline{x}(0) = \begin{bmatrix} 0 \\ 1 \end{bmatrix}. \quad (10\%)$$



16% 第一題

Let W be the subspace of the Euclidean space \mathbb{R}^4 with the standard inner product with basis $S = \{u_1, u_2, u_3\}$, where

$$u_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 0 \end{bmatrix}, u_2 = \begin{bmatrix} -1 \\ 0 \\ -1 \\ 1 \end{bmatrix}, u_3 = \begin{bmatrix} -1 \\ 0 \\ 0 \\ -1 \end{bmatrix}.$$

Transform S to a orthonormal basis $T = \{w_1, w_2, w_3\}$.

17% 第二題

Find a 3×3 nondiagonal matrix whose eigenvalues are $-2, -2,$ and 3 ; associated eigenvectors

are $\begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$, and $\begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$, respectively.

17% 第三題

Given matrix $A = \begin{bmatrix} 2 & 1 & 0 \\ 1 & 2 & 0 \\ 0 & 0 & -1 \end{bmatrix}$, Please find the spectral representation of A .

15% 第四題

一個電子檔案封包將以連續的時槽(Time Slots)來傳送直到傳完為止。假定檔案長度未知，但每一時槽仍會傳送的機率是 $(1-p)$ 。

5% (a) 試找出其將傳送多少時槽的機率規則，例如， $\Pr\{\text{傳 } N \text{ 個時槽後停止}\}=?$

5% (b) 試求預期須多少時槽可送完。

5% (c) 試問其變異數(variance)為何？

20% 第五題

根據過去經驗，一位老師知道一個學生的期末考分數會是一個平均值(mean)為 75 分，變異數(Variance)為 25 分的隨機變數。

10% (a) 試用馬可夫(Markov)不等式求出一個學生期末考分數會超過 85 分的機率之上限。

10% (b) 試用切彼靴夫(Chebyshev)不等式求出一個學生的分數會落在 65 到 85 分之間的機率下限。

15% 第六題

假定 X 是一個連續性隨機變數，其機率分配函數(Probability Distribution Function)為 $F_X(x)$ 且 $F_X(x)$ 為一嚴格遞增(Strictly increasing)函數。令 $Y = F_X(x)$ ，試求 $F_Y(y)$ 為何？



1. (20%) Given two real functions $f(t)$ and $g(t)$ and their Fourier transforms are denoted as $F(j\omega)$ and $G(j\omega)$,
- (a) (10%) Please write the definition of the convolution and cross correlation of functions $f(t)$ and $g(t)$.
- (b) (10%) Prove that $f(t) * g(t) \xrightarrow{\text{FT}} F(j\omega)G(j\omega)$ and

$$f(t)g(t) \xrightarrow{\text{FT}} \frac{1}{2\pi} [F(j\omega) * G(j\omega)], \text{ where FT denotes the Fourier transform.}$$

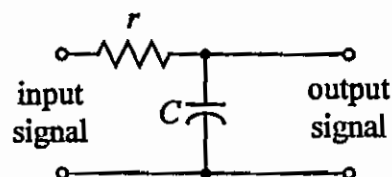
2. (20%) Twenty-four voice signals are sampled uniformly and then time-division multiplexed. The sampling operation uses flat-top samples with 1 micro-second duration. The multiplexing operation includes provision for synchronization by adding an extra pulse of sufficient amplitude and also 1 micro-second duration. The highest frequency component of each voice signal is 3.8 kHz.
- (a) (10%) Assuming a sampling rate of 8 kHz, calculate the spacing between successive pulses of the multiplexed signal.
- (b) (10%) Repeat your calculation assuming the use of Nyquist rate sampling. Which sampling rate is better?

3. (20%) Assume it is known that the power spectral density of noise at an FM receiver output is

$$S_{N_o}(f) = \begin{cases} N_o f^2 / A_c^2, & |f| \leq W \\ 0, & \text{otherwise} \end{cases}$$

where N_o and A_c are constants.

- (a) (10%) Based on this equation, describe how we can use pre-emphasis and de-emphasis to improve system performance.
- (b) (10%) Write the frequency response of the circuit shown below. Is it a pre-emphasis or a de-emphasis filter?





4. (20%) Consider a quaternary (i.e. $M=4$) communication system in which the transmitted signals are defined as:

$$s_1(t) = \begin{cases} A, & 0 < t < T/2 \\ -A, & T/2 < t < T \end{cases}, \quad s_2(t) = \begin{cases} 2\sqrt{3}At/T, & 0 < t < T/2 \\ 2\sqrt{3}A(1-t/T), & T/2 < t < T \end{cases},$$

$$s_3(t) = -s_1(t), \quad s_4(t) = -s_2(t),$$

where T denotes the symbol duration, and A is a positive constant.

- (a) (7%) Find a set of orthonormal basis functions for the set of signals. And then construct the signal constellation.
- (b) (6%) Assume equiprobable output signals from the source. Find the average transmission energy of the transmitter.
- (c) (7%) Evaluate the average symbol error probability of coherent detection when the signals are transmitted through an AWGN channel.
5. (20%) The message sequence input to an MSK transmitter is 11000110. Assume the initial phase is zero.
- (a) (6%) Plot the phase trellis according to the message sequence.
- (b) (7%) Draw the block diagram of a coherent MSK receiver and briefly describe how it works.
- (c) (7%) Comparing with QPSK, what are the major desirable properties of the MSK signal?



1. 計算機的指令格式包含：運算碼 (operation code) 及運算元 (operand).
 - (a) 若指令 ADD 表示加法，則下列三種運算元個數不同的加法指令，分別能夠完成那些不同的加法動作？(15%)
 - (i) ADD 100 200 300 (100, 200, 300 代表記憶體位址)
 - (ii) ADD 100 200
 - (iii) ADD 100
 - (b) 試舉出三種無需運算元的常見指令。(5%)
2. 試述 magnetic disk storage system 與 CD (compact disk) storage system 在資料儲存格式(storage format)與存取(access)方式上的差異。CD 的優缺為何？(15%)
3. 試說明網路分層的觀念 (layered concept)，並舉出今天在 Internet 上各層較常被使用的協定 (protocols)。(15%)
4.
 - (a) 佇列(queue)的特性為何？(2%)
 - (b) 堆疊(stack)的特性為何？(2%)
 - (c) 堆疊有那五項主要的運作(operations)？(5%)
 - (d) 如何用佇列來實現(implement)堆疊？(5%)
5. 當欲將 N 筆資料由小至大作排序時
 - (a) 何謂快速排序法(quick sort)？(4%)
 - (b) 怎樣的資料分佈情況是快速排序法的最壞情況(worst case)？(2%)
 - (c) 試分析快速排序法在最壞情況下的時間複雜度。(4%)
6.
 - (a) 設有一組已排序好的資料如下：2, 4, 6, 7, 9, 11, 13, 15, 16, 18。試分別寫出以二分搜尋演算法(binary search algorithm)來搜尋 1 和 18 的搜尋過程。(4%)
 - (b) 試寫出一個非遞迴(non-recursive)形式的二分搜尋演算法。(6%)
7. 試回答下列有關雜湊法(hashing method)的相關問題。
 - (a) 何謂雜湊函數(hashing function)？(2%)
 - (b) 列出並解釋三個常用的雜湊函數。(6%)
 - (c) 何謂溢位(overflow)？(2%)
 - (d) 列出並解釋三個常用的溢位處理方法(overflow handling method)。(6%)



I. (40%) 克漏字測驗 (20 題, 每題 2 分)

July 4 also meant fireworks. The exploding of firecrackers could __ (1) __ all day long. Fireworks were __ (2) __ in the evening. But there were many accidents. As many as 5,000 people __ (3) __ on one July 4 holiday. The demand for a "safe Fourth" became so great that many states made fireworks __ (4) __. Today large __ (5) __ of fireworks are put on by local business, clubs, or communities.

- | | | | |
|---------------|--------------|----------------|---------------|
| 1.(A)hear | (B)listen to | (C)be seen | (D)be heard |
| 2.(A)lay off | (B)laid off | (C)set off | (D)letted off |
| 3.(A)are hurt | (B)were hurt | (C)were hurted | (D)are hurted |
| 4.(A)illegal | (B)national | (C)joyful | (D)impossible |
| 5.(A)displays | (B)parades | (C)outings | (D)services |

Often boys and girls go out on Halloween not to trick or treat but to try to help other children __ (6) __ than themselves. They __ (7) __ money for the United Nations International Children's Fund. This money is used for food, medicine, and __ (8) __ for poor children all over the world. In 1950 a Sunday-school class in one small American community gave up their treats of candy and apples. __ (9) __, they asked for pennies, nickels, and dimes to give to the United Nations Children's Fund. This __ (10) __ was followed by other boys and girls.

- | | | | |
|--------------------|----------------------|-------------|-----------------|
| 6.(A)more lucky | (B)less lucky | (C)as lucky | (D)less luckier |
| 7.(A)call | (B)gather | (C)correct | (D)together |
| 8.(A)services | (B)serve | (C)served | (D)serviceable |
| 9.(A)Take place of | (B)Take the place of | (C)Instead | (D)Besides |
| 10.(A)feast | (B)traditional | (C)gift | (D)example |

As __ (11) __ goes through Chia-yi County, Taiwan __ (12) __ two zones. One is the tropical zone and __ (13) __ is the subtropical zone. The weather is generally hot and humid. __ (14) __ the summer and autumn, there are typhoons which may bring heavy rain and often __ (15) __.

- | | | | |
|-------------------------------|------------------------|-----------------|----------------|
| 11.(A)the Tropic of Cancer | (B)tropical Cancer | | |
| (C)the Cancer of Tropic | (D)Cancer Tropic | | |
| 12.(A)dividing into | (B)is divided into | (C)divided into | (D)dividing to |
| 13.(A)other | (B)another | (C)the another | (D)the second |
| 14.(A)At | (B)While | (C)With | (D)During |
| 15.(A)causes a lot of damages | (B)do a lot of damages | | |
| (C)do a great deal of damage | (D)cause many damages | | |

The salmon starts life as a little egg far up in the big river, like the Columbia in Washington. He eats little __ (16) __ in the water and as soon as the food is not enough for him, he swims __ (17) __ the river into the deep Pacific Ocean, __ (18) __ he spent most of his life. However, he will return to his home in the river where he had left before at the approach of the spawning season. __ (19) __ how far the headwaters of the river are from the ocean, he is



always persistent in swimming forward __ (20) __ he reaches his home.

16. (A)ants (B)mosquitoes (C)flies (D)insects
 17. (A)across (B)down (C)up (D)through
 18. (A)how (B)when (C)where (D)why
 19. (A)Nevertheless (B)In spite of (C)No matter (D)Any
 20. (A)to (B)since (C)when (D)until

II. (15%) 英翻中 (5 題, 每題 3 分)

21. Correct sensor and actuator placement is crucial in determining the performance of a control system
 22. An important variable affecting the comprehension of programs is their psychological complexity.
 23. Several researchers have found that workers prefer architecturally private offices to open offices and that the lack of privacy affects the level of job satisfaction.
 24. If the impulse response for a linear filter is known, then the output for any other input can easily be calculated.
 25. The modification may improve the efficiency or accuracy of the algorithm or both.

III. (15%) 中翻英 (5 題, 每題 3 分)

26. 我一生的抱負是要幫我的族人在經濟上情況好轉。(... is to help ...)
 27. 到目前傳統對我們有很大影響。(Tradition has up to)
 28. 學好電子學須要時間與技巧。(Itto...)
 29. 只有利用每天練習才能精通英文。(Only by master.....)
 30. 我確信“有志竟成”。(.... sure....Where....)

IV. (12%) 閱讀測驗 (31-36) (6 題, 每題 2 分)

What comes into your mind when you think about robots? Do you imagine armies of evil metal monsters planning to take over the world? Or, perhaps of mechanical men who have been created as guards or soldiers by a mad genius? Or maybe you think of man-like robots who act, think, and look like human beings. In fact robots like these have more to do with science fiction films than with real life. In the real world robots are machines that do jobs which otherwise have to be done by people. Robots either operate by themselves or under the control of a person.

In a car factory, for example, robot machinery can put together and paint car bodies. On the sea bed remote controlled underwater machines with mechanical arms can perform tasks too difficult for divers. Robot spacecraft can explore the solar system and send back information about planets and stars.



Many robots have computer brains. Some robots are fitted with cameras, sensors, and microphones which enable them to see, to feel, and to hear. And some robots can even produce electronic speech.

All this does not mean that a robot can think and behave like a human being. Present day robots have to be programmed with a good deal of information before they can carry out even simple tasks.

31. Robots in real life

- (A) can behave like human beings.
- (B) have the ability to control the world.
- (C) can act as the evil guards of a tyrant.
- (D) can help us with a lot of work.

32. According to this article, which of the following is NOT true about robots in the real world?

- (A) Some robots are as creative as artists.
- (B) Some robots can help manufacture cars.
- (C) Some robots can see and hear.
- (D) Some robots can explore outer space.

33. Robots can perform many tasks for man because

- (A) they have intelligence.
- (B) they have computer programs stored in them.
- (C) they can imitate human beings.
- (D) they have the ability to learn new things.

Doctors can be so much concerned with curing diseases that they may fail to notice that sometimes what troubles a patient is not really a disease at all. Dr. Meyer Schwartz described such a case in one of his medical reports.

Dr. Schwartz was on duty at a hospital one morning a few days after Christmas when a man came in complaining only of "blueness to his face of one hour's duration." He reported no other signs of illness, no itching, dizziness or shortness of breath, and no history of heart disease or bleeding disorders. It was only 10:15 a.m. and all the patient had done that day was shower, shave, and dress. So far, his hands and body were still their normal color, but on both sides of his face, it was distinctly blue up to the cheekbones. Knowing that blue skin might indicate a lack of oxygen in the blood or an undesirable drug reaction, Dr. Schwartz checked the patient thoroughly. Finding nothing else out of the ordinary, he sent the blue man home. At 5:30 p.m. the man called Dr. Schwartz to report that he had washed his face and the blue came off." He had received blue towels as Christmas gifts and had used one of them that morning for the first time.

34. The doctor sent the blue-faced man home after

- (A) washing the patient's face.
- (B) curing the blueness with medicine.



- (C) consulting with other doctors.
(D) a careful examination of the patient.

35. The main point of this passage is that
(A) some diseases are often difficult for doctors to recognize.
(B) doctors are often too careless in their medical treatments.
(C) doctors may sometimes be misled by a patient's complaints.
(D) some patients like to play practical jokes on doctors.

36. The cause of the blueness was known only after
(A) a series of examinations was carried out on the patient.
(B) the blueness suddenly went away with medication.
(C) another doctor checked the patient more carefully.
(D) the patient realized what he had done with his Christmas gifts

V. (18%) (A)以 A.B.C.D.E. ... 為代號填入37-40 的空格中。(4題, 每題2分)

: A = for a while B = for the first time C = stay up
: D = used to E = was not used to F = well G = good

I was not well prepared for the midterm exam until yesterday, so I decided to __ (37) __ to prepare for the exam. I began to study at 7 o'clock. I hoped to study deep into the night, but I felt so sleepy after studying a couple of hours that I had to stop to go out for a walk __ (38) __. After taking a walk, I felt much better. I went back my room to study again. I refreshed myself with a cup of tea. I didn't stop studying until midnight. I went to bed late. I __ (39) __ going to bed so late, so I couldn't sleep __ (40) __ in my life.

(B)以 A.B.C.D.E.F 為代號填入41-45 的空格中。(5題, 每題2分)

: A = something the matter with B = get along with
: C = put up with D = do without
: E = keep up with F = do with

41. It is easy to _____ John, because he is kind and considerate.
42. Helen works so fast that no one in the office can _____ her.
43. With prices so high I will have to _____ a new suit this year.
44. I refuse to _____ his rude actions any longer.
45. Is there _____ Helen? She looks pale.



(1) Find the general solution for the following equations.

(i) $(1+x)dy - ydx = 0$ (15%)

(ii) $y'' - 6y' + 9y = 8e^{3x}$ (15%)

(2) Find the Laplace transform of the function (10%)

$$f(t) = (3t+1)u(t-1)$$

where $u(t)$ is the unit step function.

(3) Find the inverse Laplace transform of the function (10%)

$$F(s) = \frac{s}{s^2 + 4s + 5}$$

(4) Solve the following differential equations. (15%)

$$\begin{cases} x' + y' + x - y = 0 \\ x' + 2y' + x = 0 \end{cases}, \quad x(0) = y(0) = 0$$

(5) Determine the values of k such that the following system of linear equations has

(i) exactly one solution, (7%)

(ii) an infinite number of solutions, (7%)

(iii) no solution. (6%)

$$kx + 2ky + 3kz = 4k$$

$$x + y + z = 0$$

$$2x - y + z = 1$$

(6) Write the vector $w = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ as a linear combination of vectors

$$v_1 = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}, \quad v_2 = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}, \quad \text{and} \quad v_3 = \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix}. \quad (15\%)$$