

系所組別 醫學工程研究所甲、乙、丁組

考試科目 工程數學

考試日期：0307 · 節次：3

※ 考生請注意：本試題 可 不可 使用計算機

1. (30 points) First- and Second-Order Differential Equations (15 points each)

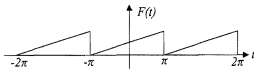
- (a) Suppose that you turn off the heat in your home at night 2 hours before you go to bed; call this time $t=0$. If the temperature T at $t=0$ is 66°F and at the time go to bed ($t=2$) has dropped to 63°F , what temperature can you expect in the morning, say, 8 hours later ($t=10$)? Of course, this process of cooling off will depend on the outside temperature T_A , which we assume to be constant at 32°F .
- (b) Find the steady-state current in the RLC -circuit(圖一), assuming that $L = 1$ henry, $R = 2000$ ohms, $C = 4 \times 10^{-3}$ farad, and $E(t) = 110\sin 415t$ (66 cycles/sec).



圖一

2. (30 points) Laplace Transform and Fourier Analysis (15 points each)

- (a) For a full-wave rectification of $\sin \omega t$, find its Laplace Transform.
- (b) Find the Fourier of the function. (圖二)



圖二

3. (20 points) Linear Algebra (10 points each)

- (a) Use Gauss Elimination to solve the follow linear system.

$$\begin{aligned} x_1 + x_2 + x_3 &= 0 \\ -x_1 + x_2 - x_3 &= 0 \\ 10x_2 + 25x_3 &= 90 \\ 20x_1 + 10x_2 &= 80 \end{aligned}$$

- (b) Find the inverse, eigenvalues and eigenvectors of the matrix $[B]$.

$$[B] = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$$

4. (20 points) Statistics and Numerical Analysis (10 points each)

- (a) What is spline in function approximation, and ill-condition of a linear system.
- (b) Describe the normal distribution and Binomial distribution.