大同大學 101 學年度研究所碩士班入學考試試題

考試科目:工程數學　　所別:生物工程研究所　　

註:本次考試 不可以參考自己的書籍及筆記； 不可以使用字典； 不可以使用計算器。

1. Solve the initial value problem:
   $y' + (4/x)y = 2$; $y(0) = 3$
(10分)

2. Find the Laplace transform of the function $f(t) = t-\cos(5t)$.
   [hint: $f(t) = t$ Laplace transform of $f(t)$ is $F(s) = 1/s^2$;
   $f(t) = \cos(at)$ Laplace transform of $f(t)$ is $F(s) = s/(s^2 + a^2)$]
(10分)

3. Find the general solution of the second order differential equation $y'' + 6y' + 9y = 0$.
(20分)

4. Find the Fourier series of the function on the interval.
   $f(x) = x^2 - x + 3$, $-2 \le x \le 2$
(20分)

5. For the system of linear differential equations $x_1' = 5x_1 + 3x_2$, and $x_2' = x_1 + 3x_2$,
(a) verify that $x_1(t) = -c_1e^{2t} + 3c_2e^{6t}$ and $x_2(t) = c_1e^{2t} + c_2e^{6t}$ satify the system.
(b) Form a fundamental matrix for the system.
(20分)

6. Solve the nonhomogeneous system
   $3x_1 - 2x_2 + x_3 = 6$
   $x_1 + 10x_2 - x_3 = 2$
   $-3x_1 - 2x_2 + x_3 = 0$
[hint: transform the system to matrix form]
(20分)