國立臺北科技大學 103 學年度碩士班招生考試

系所組別：3210 環境工程與管理研究所甲組

第三節　工程數學　試題

注意事項：

1. 本試題共五題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1.To give the general solution for the differential equation： (15%)

$$y'' - 3y' + 2y = 0$$

2. To solve the following initial value differential equation： (20%)

$$y'' - 2y' + 10\,y = 0, \quad y(0)' = 0 \quad y(0) = 3$$

3.To find the solution for the following linear system (equations)： (20%)

$$\begin{cases} x_1 + x_2 + 2x_3 + 3x_4 = 1 \\ x_1 + 2x_2 + x_3 + 4x_4 = 1 \\ 2x_1 + 5x_2 + 2x_3 + x_4 = 2 \\ x_1 + \quad 3x_3 + 2x_4 = 5 \end{cases}$$

4.To find the Fourier transform for the following function： (20%)

$$F(x) = -1/4, \quad -\pi < x < 0,$$
$$F(x) = 1/4 \quad 0 < x < \pi,$$

and $F(x) = F(x+2\pi)$

5. A flow diagram of completely mixing active sludge tank for wastewater treatment is as following. Assuming pollutant disappear rate in the sludge tank is a first-order linear function of C_A (namely kC_A), to find out the relationship between C_{A0} and C_A with step-by-step equation setup, where C_A is the concentration of pollutants (like BOD), F is flow rate, V is tank volume, and $C_A = C_{A0}$ while t (time)=0. Any assumption is provided if necessary (25%).