大葉大學 九十四 學年度 研究所碩士班 招生考試試題紙					
系 所 別	組別	考 試 科 目 (中文名稱)	考 試 日 期	節 次	備 註
環境工程學系碩士班	甲	工 程 數 學	3月27日	第 一 節 08:30~10:00	共 1 頁

註：考生可否攜帶計算機或其他資料作答，請在備註欄註明（如未註明，一律不准攜帶）

1. Exam the differential equation $(2ydx+dy)e^{2x}=0$ for "exact" condition or not？ Also, find the solution for it with initial condition $y(0)=2$？【20%】

2. Solve the non-homogeneous ODE $y''-2y'+y=e^x\sin x$ with initial conditions of $y(0)=1$ & $y'(0)=1$ by the method of undetermined coefficient？【20%】

3. Two tanks with different size are connected by a pipeline as shown in figure below. Initially, **40g** and **10g** salt are put into A and B tank separately to mix well with water. Starting the system to mix the two tanks by flow rate shown in figure and measuring the amount of salt in tanks with times.

    ① Try to formulate the system of ODEs？【10%】

    ② Solve the ODEs by **Laplace Transform**？【20%】

   [Hint：Set $y_1(t)$、$y_2(t)$ as the amount of salt in A,B tank. By using the continuity equation as $dy/dt =$ (inflow rate of salt)–(outflow rate of salt), then you can formulate the system of 1st order ODEs]
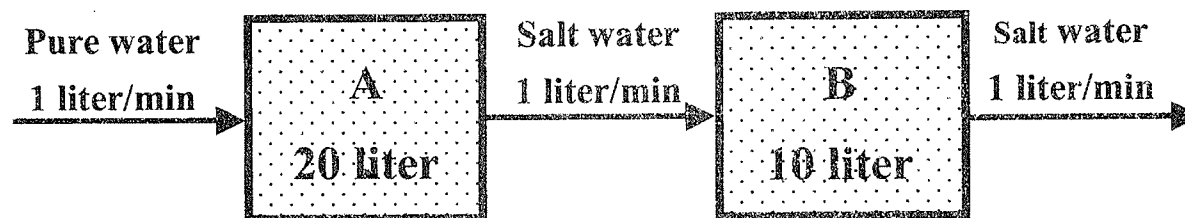
4. Find the eigenvalues of the following matrix ？【15%】

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\theta & -\sin\theta \\ 0 & \sin\theta & \cos\theta \end{bmatrix}$$

5. Solve the ODE $(1+x)y'-y=0$ with initial condition $y(0)=4$ for series solution by **Taylor's formula:** $y(x)=\Sigma(y^{(m)}(0)/m!)x^m$ ？ Expressed until x^4 term.【15%】