

淡江大學九十四學年度碩士班招生考試試題 ⁹³⁻¹

系別：化學工程與材料工程學系 科目：工程數學

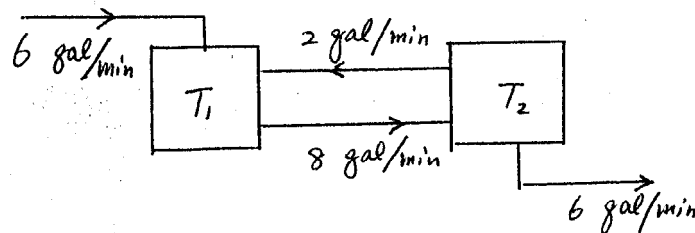
准帶項目請打「V」

V	簡單型計算機
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本試題共 2 頁

1. Tank T_1 in the following figure contains initially 100 gal of pure water. Tank T_2 contains initially 100 gal of water in which 150 lb of salt are dissolved. The inflow into T_1 is 2 gal/min from T_2 and 6 gal/min containing 6 lb of salt from the outside. The inflow into T_2 is 8 gal/min from T_1 . The outflow from T_2 is $2+6=8$ gal/min, as shown in the figure. The mixtures are kept uniform by stirring. Obtain the system of model equations and solve it (required to use the Laplace Transform) to find the salt contents $y_1(t)$ and $y_2(t)$ in T_1 and T_2 , respectively.

(25%)



2. Find the eigenvalues and the eigenvectors of the following matrix, (15%)

$$\begin{pmatrix} 3 & 5 & 3 \\ 0 & 4 & 6 \\ 0 & 0 & 1 \end{pmatrix}$$

3. Find a power series solution in powers of x of the following differential equation.

(25%)

$$y'' - 4xy' + (4x^2 - 2)y = 0$$

4. Solve the following system,

(35%)

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, \quad \begin{array}{ll} u(x,0) = 3, & 0 < x < 1 \\ u(0,t) = 1, & t \geq 0 \\ u(1,t) = 2, & t \geq 0 \end{array}$$