系別：機械與機電工程學系　　　科目：工程數學

考試日期：3 月 8 日(星期日) 第 2 節　　　　　　本試題共九大題，一頁

1. Solve $y' = 4x^2 - \dfrac{y}{x}$;　$y(1) = 2$.　(10%)

2. Solve $y'' - 2y' - 8y = 0$,　$y(0) = 2$,　$y'(0) = 2$.　(10%)

3. Solve $y'' + 2y' - 3y = 5e^{2x}$ by the method of undetermined coefficients.　(10%)

4. Solve $y'' + 4y' + 3y = \delta(t-3)$,　$y(0) = y'(0) = 0$ by Laplace transform.　(10%)

5. Solve

$$\begin{cases} x_1 + x_2 - 5x_4 + 3x_5 = 3 \\ x_2 - 3x_4 + 2x_5 = 1 \\ x_1 - x_2 + x_3 + 2x_4 - 2x_5 = -2 \end{cases}$$
　by reduced matrix.　(10%)

6. Solve

$$|\mathbf{A}| = \begin{vmatrix} 4 & 2 & -3 & 1 \\ 1 & -3 & 1 & 2 \\ 3 & 1 & 5 & -2 \\ -2 & -5 & 3 & 1 \end{vmatrix}.$$
　(10%)

7. Solve

$$\begin{cases} x_1' = 2x_1 \\ x_2' = x_1 + 2x_3 \\ x_3' = 3x_3 \end{cases}$$
.　(15%)

8. Evaluate $\displaystyle\iint\limits_{\Sigma} z(x^2 + y^2)\,d\sigma = ?$

with Σ is the part of the cone $z = \sqrt{x^2 + y^2}$ for $x^2 + y^2 \le 4$.　(10%)

9. P.D.E.: $\dfrac{\partial^2 y}{\partial t^2} = 4\dfrac{\partial^2 y}{\partial x^2}$,　$0 < x < 3$,　$t > 0$　(15%)

　B.C.: $y(0,t) = y(3,t) = 0$,　$t > 0$

　I.C.: $y(x,0) = 0$,　$0 < x < 3$

　　　$\dfrac{\partial y}{\partial t}(x,0) = 4$,　$0 < x < 3$