

國立台灣科技大學一百學年度碩士班招生試題

系所組別：化學工程系碩士班

科目：工程數學

總分 100 分，請依序作答，並詳列計算過程。

1. 解釋名詞：何謂 Partial differential equation?
Linear differential equation?
Solution of differential equation? (12%)
2. Find the solution of DE: $y'' - 3y' + 2y = \cos(e^{-x})$. (20%)
3. Solve the initial value problem: $y'' - 4y' + 13y = 4\delta(t-2)$; $y(0) = 0$, $y'(0) = 1$ (16%)
4. Evaluate the line integral with respect to arc length: $\int_C yz ds$,
with C the parabola: $z = y^2$, $x = 1$ for $0 \leq y \leq 2$. (12%)
5. For systems of linear differential equations, $X' = AX$, $A = \begin{bmatrix} 3 & 0 & -2 \\ 0 & 2 & 0 \\ -2 & 0 & 0 \end{bmatrix}$
Please find out if A is diagonalizable (show clearly the processes),
also find the fundamental matrix, and the general solution. (16%)
6. For a thin, homogeneous bar of length L, given the initial temperature throughout the bar is $f(x)$, the temperature at both ends at all time are zero,
i.e. $\frac{\partial \theta}{\partial t} = a^2 \frac{\partial^2 \theta}{\partial x^2}$, $0 < x < L$, $t > 0$, $\theta(0, t) = \theta(L, t) = 0$, and $\theta(x, 0) = f(x)$
Please determine the temperature distribution $\theta(x, t)$ on the bar. (16%)
7. Please find all z such that $e^z = 2 + i$ (8%)

