

國立台灣科技大學九十九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

(總分為100分)

請依序作答，並詳列計算過程。

1. Solve $y' = \sin y / (2y - x \cos y)$ (10%)

2. Solve $y'' + 4y' - 2y - 2x^2 + 3x - 6 = 0$ (10%)

3. Three points in space: $A = (1, -2, 6)$, $B = (3, 0, 1)$, $C = (4, 2, 4)$. Use the principles of vector to find the cosine of the angle between \overline{AB} and the line from the point A to the midpoint of \overline{BC} . (15%)

4. Use the matrix method to solve the following simultaneous equations.

$$x_1 + 3x_2 - 2x_3 = -7$$

$$4x_1 + x_2 + 3x_3 = 5$$

$$2x_1 - 5x_2 + 7x_3 = 19$$
 (15%)

5. Please find the general solution of the system (16%)

$$y_1' = -y_1$$

$$y_2' = 2y_1 - y_2$$

$$y_3' = 2y_1 + 3y_2 - y_3$$

6. (6a) please find the Fourier series of periodic function (16%)

$$f(x) = \frac{x^4}{2} \text{ for } -2\pi \leq x \leq 2\pi \quad (8\%)$$

(6b) Please use the result of (6a) to evaluate $\sum_{n=1}^{\infty} \frac{1}{n^2}$ and $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^2}$ (8%)7. Please calculate $\oint \left(\frac{3z-1}{z^2-5iz-6} \right) dz$, for the curve C is the circle of

radius $\frac{1}{2}$ about $-3i$ (12%)

8. Please find the roots of $1-i$ (6%)