

國立高雄應用科技大學
九十六學年度碩士班招生考試
土木工程與防災科技研究所(甲組、乙組)

准考證號碼 (考生必須填寫)

工程數學

共 1 頁，第 1 頁

注意：a. 本試題共 7 題，共 100 分。

b. 作答時不必抄題。

c. 考生作答前請詳閱答案卷之考生注意事項。

1. A general solution of $y'' - 2y' + y = 0$ on any interval is $y = (c_1 + c_2x)e^x$, where c_1 and c_2 are arbitrary constants. Please show that the solutions in y are of linear independence. (10%)

2. Solve $\begin{cases} x'' - 2x' + 3y' + 2y = 4 \\ 2y'' - x' + 3y = 0 \end{cases}$, with $x(0) = x'(0) = y(0) = 0$ (20%)

3. Find the velocity, speed, and acceleration of the motion given by

$$\vec{r}(t) = 5\cos t \vec{i} + \sin t \vec{j} + 2t \vec{k}$$

at the point $P(\frac{5}{\sqrt{2}}, \frac{1}{\sqrt{2}}, \frac{\pi}{2})$. What kind of curve is the path? (12%)

4. Please find the period of the function $f(x) = |\sin x| + |\cos x|$. (8%)

5. Evaluate $\iint_S \vec{F} \cdot d\vec{S}$ when $\vec{F} = x^2 \vec{i} + 3y^2 \vec{k}$ and S is the portion of the plane $x + y + z = 1$ in the first octant. (20%)

6. Fourier series can be derived by means of an orthogonal series expansion. It means that Fourier series is a kind of orthogonal series. For example, a periodic function $f(x)$ can be expressed by Fourier series with the form

$$f(x) = a_0 + \sum_{n=1}^{\infty} (a_n \cos \frac{n\pi}{L} x + b_n \sin \frac{n\pi}{L} x),$$

where the period of $f(x)$ is $2L$. What is the basis of the orthogonal set for this Fourier series? (10%)

7. Evaluate $\oint_C (\frac{7z-6}{z^2-2z}) dz$, where C is the unit circle around the path of counterclockwise. (20%)