國立高雄應用科技大學

九十七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

試題有 7 題，共 1 頁

1. If $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$ is a position vector and ∇ is the differential operator, please find the value of (1) $\nabla \cdot \vec{r}$ and (2) $\nabla \times \vec{r}$.

(10%)

2. Evaluate $\iint_S \vec{F} \cdot d\vec{S}$ where $\vec{F} = x\vec{i} + y\vec{j} + z\vec{k}$ and ***S*** is the sphere $x^2 + y^2 + z^2 = 9$.

(20%)

3. Find the principal directions of the elastic deformation **y=Ax** with given matrix **A**：

$$\mathrm{A} = \begin{bmatrix} 3.0 & 1.5 \\ 1.5 & 3.0 \end{bmatrix}$$

(10%)

4. Solve the ordinary differential equation $y''+4y'+4y = 3xe^{-2x}$.

(15%)

5. Solve $y''+y = 4\delta(t-2\pi)$ subject to $y(0)=1$, $y'(0)=0$, where $\delta(t)$ = unit impulse function.

(15%)

6. The usual form of Fourier series is

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

Please write down (1) the amplitude and phase angle form and (2) the complex form of the Fourier series.

(15%)

7. Evaluate the counterclockwise integration $\int_C \frac{\cos z}{z} dz$ around the circle $C: |z| = 1$.

(15%)