國立彰化師範大學 97 學年度碩士班招生考試試題

系所：　 光電科技研究所碩士班 　　　　　　　　科目：　 工程數學 　

1. Evaluate the following equations.

   (a)　$x^2 y' = 2 + y$　(10%)

   (b)　$x^2 y'' - 5xy' + 8y = 3\ln(x)$　(15%)

2. Solve the following problems:

   (a) Show that　$\vec{F} = yz\hat{i} + xz\hat{j} + xy\hat{k}$　is solenoidal. (5%)

   (b) Show that　$\vec{F} = (4xy - z^3)\hat{i} + 2x^2\hat{j} - 3xz^2\hat{k}$　is irrational. (5%)

3. Evaluate　$\displaystyle\int_0^\pi \frac{1}{\alpha + \beta \cos(\theta)} d\theta$, where　$\alpha > \beta > 0$. (15%)

4. Find the Fourier series of the given function　$f(x) = x^2/2$　$(-\pi < x < \pi)$. (20%)

5. Use the Laplace transform method to solve the following problems.

   (a)　$f(t) = |\sin t|,\ L[f(t)] = ?$　(15%)

   (b)　$y'' + 2y' + 2y = \delta(t - \pi),\ y(0) = y'(0) = 0$　(15%)