南台科技大學100學年度研究所考試入學招生考試

系組： 機械系、奈米所、能源所　　准考證號碼：□□□□□□

科目： **工程數學(123)**　　(請考生自行填寫)

注意事項	一、 請先檢查准考證號碼、報考系(組)別、考試科目名稱，確定無誤後再作答。 二、 所有答案應寫於答案紙上，否則不予計分。 三、 作答時應依試題題號，依序由上而下書寫，作答及未作答之題號均應抄寫。

1. Solve the initial value problem　10%

   $y'+(\cot x)y=-e^{\cos x}, \quad y(\frac{\pi}{2})=2$

2. Find the general solution of the differential equation　10%

   $4y''+4y'+y=0$

3. (a) Find the Laplace transform of the function f(t), where　5%

   $f(t)=t^3e^{3t}$

   (b) Find the inverse Laplace transform of the function G(s), where　5%

   $G(s)=\dfrac{e^{-2s}}{s^2+2s+3}$

4. Function f(x) can be expressed as　10%

   $f(x)=\sum_{n=1}^{\infty}\frac{1}{3^n n^2}(x+2)^n,$

   find its radius of convergence.

5. Let D be the region bounded by the three coordinate planes and the plane x+y+z=1. Verifying the divergence theorem if

   $\vec{F}=x\vec{i}+y\vec{j}+z\vec{k}$　15%

6. Given a matrix $A=\begin{bmatrix}-1 & -3 & 2\\ 2 & 0 & 1\\ 1 & 2 & -2\end{bmatrix}$, find its determinant and inverse. 10%

7. Expand periodic function $f(x)=\begin{cases}-1 & -1<x<0\\ 1 & 0\le x<1\end{cases}$ in a Fourior series.　15%

8. Solve the partial differential equation

   $\dfrac{\partial^2 u}{\partial x^2}=x^2+y^2, u(0,y)=\sin y, u(1,y)=y^2$. 10%

9 Evaluate $\int_C z^2 dz$, where C is the curve $z(t)=t^2+ti, 0\le t\le 1$.　10%