國立中央大學99學年度碩士班考試入學試題卷

所別：水文與海洋科學研究所碩士班 不分組（一般生）　科目：應用數學　共 1 頁 第 1 頁

本科考試禁用計算器　　＊請在試卷答案卷（卡）內作答

1. Solve $t\frac{dy}{dt}+y(t)+4=0$ (15 points)

2. Solve the initial value problem (15 points)

$$\frac{d^2y}{dt^2}+2\frac{dy}{dt}+2y=0,\quad at\ t=0\cdots y=1,\ dy/dt=-1$$

3. Solve the following systems of linear equations (10 points)

$5x+3y-3z=-1$

$3x+2y-2z=-1$

$2x-y+2z=8$

4. The position vector of a moving particle as a function of time is denoted as $\vec{r}(t)$, where t ($\geqq 0$) is the time. For the following $\vec{r}(t)$, please describe the trajectory, the velocity vector, the speed, and the acceleration vector of the particle:

a. $\vec{r}(t)=\sin t\,\vec{j}$ (15 points)

b. $\vec{r}(t)=10e^{-t}i+5e^{-t}\vec{j}$ (15 points)

5. A horizontal scalar field is given as $f(x,y)=2x^2+3y^2$. This scalar field is in balance with a vector field $\vec{v}(x,y)$ as $\nabla f+\vec{k}\times\vec{v}=0$, where $\vec{k}$ is the unit vector in z direction.

a. find the gradient f at the point (2, 1) (5 points)

b. find the vector $\vec{v}(2,1)$ (10 points)

c. find $\nabla\times\vec{v}$ at the point (2, 1) (10 points)

d. find $\nabla\bullet\vec{v}$ at the point (2, 1) (5 points)

參考用