逢甲大學100年度產業碩士專班【春季班】試題　編號：001

科目	工程數學	適用系所	資通訊與電控產業碩士專班	時間	一〇〇分鐘

※請務必在答案卷作答區內作答。　　共 1頁第 1頁

1. Consider the following differential equation (20%)

$$y'(x)-3y(x)=3x+2$$

(1) Solve the differential equation. (10%)

(2) Very your answer in (1), by series method at $x=0$. (10%)

2. Slove the following integral equation (15%)

$$y(t)=2\cos 2t+e^{t}\int_0^t y(\lambda)e^{-\lambda}d\lambda$$

3. Use the Laplace transform to solve $x(t)$ and $y(t)$ for non-homogeneous linear differential equation system with their initial conditions given by

$$\begin{cases}\dfrac{dx(t)}{dt}-2x(t)-3y(t)=2e^{2t}\\ -x(t)+\dfrac{dy(t)}{dt}-4y(t)=3e^{2t}\end{cases},\quad x(0)=0, y(0)=0 \quad (15\%)$$

4. Using Fourier integral theorem of $f(x)=e^{-x}$ to show that $\int_0^\infty \frac{\cos\alpha x}{1+\alpha^2}d\alpha=\frac{\pi}{2}e^{-x}$ (15%)

5. A infinitely long, thin, conducting circular tube of radius b is split in two halves. The upper half is kept at a potential $V=V_0$, and the lower half at $V=-V_0$. Determine the potential distribution inside the tube? (20%)

(Hint: The potential V satisfy Laplace's equation $\nabla^2 V(r,\phi)=0$, where r,ϕ are cylindrical coordinates)

6. $\int_0^\infty \frac{x^3dx}{(1+x)^5}=?$ (15%)