國立中山大學107學年度碩士暨碩士專班招生考試試題

科目名稱：工程數學【海工系碩士班甲組】　　題號：459001

※本科目依簡章規定「不可以」使用計算機(問答申論題)　　

1. 【Ordinary Differential Equations】 **(20%)**

   (a) Solve $\left(x^2D^2-4xD+6I\right)y=21x^{-4}$ (10%)

   (b) Solve $y''+y=\cos x-\sin x$ by undetermined coefficients and variation of parameters respectively. (10%)

2. 【Vector Calculus】 **(20%)**

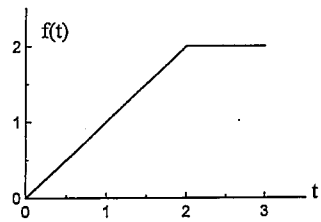
   Evaluate $\iint_S (curl\vec{F})\cdot\vec{n}\,dA$, $\vec{F}=[z^2,\ \frac{3}{2}x,\ 0]$, $S: 0\le x\le a,\ 0\le y\le a,\ z=1$.

   (a) directly for given $\vec{F}$ and S (10%); (b) verify "Stokes's Theorem" (10%).

3. 【Laplace Transform】 **(20%)**

   (a) Find the Laplace transform. (10%)

   $$f(x)=\begin{cases} t & 0<t<2 \\ 2, & 2<t<3 \\ 0 & t>3 \end{cases}$$

   (b) Find the inverse transform by convolution and differentiation respectively.. (10%)

   $$\frac{2\omega^2}{(s^2+\omega^2)^2}$$

4. 【Fourier Analysis】 **(15%)**

   A function $f(x)=2+x^2$, $0\le x\le 2$ is expanded into :

   (a) Fourier sine series (5%); (b) Fourier consine series (5%); (c) Fourier series (5%)

   For $x=2$, what values of each series converge to.

5. 【Partial Differential Equation】 **(15%)**

   Solve the following PDE using the Method of Separation of Variables.

   $$\frac{\partial^2\phi}{\partial t^2}=\frac{\partial^2\phi}{\partial x^2},\ 0<x<L,\ t>0$$

   boundary conditions : $\phi(0,t)=\phi(L,t)=0$, $t>0$

   initial conditions : $\phi(x,0)=x(L-x)$, $\phi_t(x,0)=0$

6. 【Complex Analysis】 **(10%)**

   Evaluate $\int_0^{2\pi}\frac{d\theta}{3-\cos\theta}$

試題隨卷繳回