國立中山大學100學年度碩士班招生考試試題

科目：工程數學【材光系碩士班乙組】

1. Find the general solution of $2y\dfrac{d^3y}{dx^3}+2(y+3\dfrac{dy}{dx})\dfrac{d^2y}{dx^2}+2(\dfrac{dy}{dx})^2=\sin x$

(15%)

2. Use Frobenius method to find the general solution of $x^2y''+6xy'+(6-4x^2)y=0$.　(20%)

3. Find the eigenvalues, eigenfunctions and verify the orthogonality of the solution

by direct calculation. $y''+\lambda y=0$, $y(\pi)=y(-\pi)$, $y'(\pi)=y'(-\pi)$.　(15%)

4. A surface is defined by $z=x^2+y^2$, calculate the surface are defined

on the domain $0\le x^2+y^2\le 4$

(15%)

5. $f(x)=x,\quad -\pi\le x\le\pi,\quad f(x)=f(x+2\pi)$, solve

(1) Fourier series,　(20%, each 10%)

(2) complex Fourier sereis

6. Solve nonhomogeneous boundary condition of heat equation

$$\dfrac{\partial u(x,t)}{\partial t}=c^2\dfrac{\partial^2 u(x,t)}{\partial x^2}$$

(15%)

$u(0,t)=A_1, u(L,t)=A_2, u(x,0)=f(x)$, where $0<x<L,\ t>0$