大同大學 九十一 學年度 轉學考試 試題

考試科目：工程數學　系別：化學工程學系　級別：三年級 第 1 頁，共 1 頁

註：本次考試不可以參考自己的書籍及筆記；　不可以使用字典；　不可以使用計算器。

Problem 1~5 solve the ODEs.

1. $y'+2y=x$ (5%)

2. $x^2y''-9xy'+25y=0$ (5%)

3. $y''+\frac{1}{x}y'+(1-\frac{1}{4x^2})y=0, y_1=\frac{1}{\sqrt{x}}\cos(2x), x>0$ (10%)

4. $y''+2y'-3y=13\cos(2x)$ (10%)

5. $y''+4y'+4y=\begin{cases}1, & 0<t<2\\ 0, & t>2\end{cases}$, $y(0)=1, y'(0)=2$ (10%)

6. Determine whether the function f(x)=|x|, -π<x<π, is even, odd, or neither and expand in an appropriate Fourier cosine series, Fourier sine series or Fourier series. (10%)

$$ku_{xx}=u_t, 0<x<L, t>0$$

7. Solve the problem： $u(0,t)=0, u(L,t)=0$ (25%)

$$u(x,0)=\begin{cases}1, 0<x<L/2\\ 0, L/2<x<L\end{cases}$$

8. Suppose heat is lost from the lateral surface of a thin rod of length L into a surrounding medium at temperature zero. If the linear law of heat transfer applies, then the heat equation takes on the form $ku_{xx}-hu=u_t$, 0<x<L, t>0, h a constant. If the initial temperature is f(x) throughout and the ends x=0 and x=L are insulated. Write all the possible **initial and boundary conditions**. (15%)

9. Find $\vec{\nabla}\cdot F$ for $F=xy^2+3x^2-z^3$ and $\vec{\nabla}\cdot\vec{F}$ for the vector $\vec{F}=x^2y\,\vec{i}+xy^2\,\vec{j}+2xyz\,\vec{k}$. (10%)