國立中央大學八十六學年度碩士班研究生入學試題卷

所別: 大氣物理研究所　不分組　科目: 應用數學　共 1 頁 第 1 頁

參考用

1. Describe the methods of solving a linear, second-order differential equation,

$$A(x)y'' + B(x)y' + C(x)y = r(x),$$

if

(a). $A(x) = a$, $B(x) = b$, $C(x) = c$ and $r(x) \neq 0$,

(b). $A(x) = x^2$, $B(x) = x$, $C(x) = c$ and $r(x) \neq 0$.

(15%)

2. Solve the following boundary value problem

$$y'' - 9y = 0, \qquad y(-4) = y(4) = \cosh 12$$

(15%)

3. Using the Laplace transformation, solve the following initial value problem,

$$y'' + 2y' + 5y = 8e^t + \delta(t-1), \qquad y(0) = 2, \quad y'(0) = 0$$

(15%)

4. Evaluate the surface integral $\iint_S \vec{F} \bullet \hat{n} dA$, where

$\vec{F} = e^x \hat{i} - ye^x \hat{j} + 3z \hat{k}$, S the surface of $x^2 + y^2 \leq a^2$, $|z| \leq h$

(10%)

5. Find the eigenvalues and eigenvectors

$$\begin{bmatrix} 0 & 2 & 0 \\ 3 & -2 & 3 \\ 0 & 3 & 0 \end{bmatrix}$$

(15%)

6. Represent the function f(x) in Fourier cosine integral,

$$f(x) = \begin{cases} 1 & \text{if } 0 < x < 1 \\ 0 & \text{if } 1 < x \end{cases}$$

(15%)

7. Evaluate the integral

$$\int_0^{2\pi} \frac{\sin\theta}{3 + \cos\theta} d\theta$$

(15%)